Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

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ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN — Associate Editors
RICHARD ALDEN HOWARD
CARROLL EMORY WOOD, JR.

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The New England Botanical Club, Inc.

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BOTANIZING ON THE GASPÉ PENINSULA 1902–1904

M. L. Fernald[1]

Half-a-century ago the name Gaspé meant little or nothing to most botanists of northeastern America. To those with a more intimate knowledge of earlier collections it merely meant the general region which included Mt. Albert and Tabletop and a few other localities where John A. Allen (1863–1916), in 1881, and John Macoun, in 1882, had found a few local or unusual plants. These I happened to know about because, while he was working on the *Polypetalae* for Gray's *Synoptical Flora*, Dr. Robinson had called them to my attention. Otherwise, to me and more so to most others Gaspé was just a large peninsula on maps of the Province of Quebec.

In July, 1902, Emile F. Williams[2] and I, after being the guests of Dr. George G. Kennedy[3] at Cutler in eastern Maine, found ourselves with a couple of weeks left of Williams's vacation. On the bleak outer coast near Cutler we had been duly impressed by the subarctic or high-northern plants (*Iris Hookeri*,[4] *Montia lamprosperma, Sedum Rosea, Empetrum nigrum*, etc.). Consequently, by a very simple line of reasoning we concluded that,

[1] Until the day of his death, Professor Fernald had been working on a journal account of field trips to the Gaspé Peninsula, projected to cover the years from 1902 to 1934. He had sufficiently completed the years 1902–1904 to make this portion of his manuscript publishable.—Eds.

[2] See biographical sketch with portrait by B. L. Robinson in Rhodora, xxxiii. 1–18 (1931).

[3] See biographical sketch with portrait by Emile F. Williams in Rhodora, xxi. 25–35 (1919).

[4] Authors omitted if names in Gray's Manual, ed. 8 (Fernald).

since a considerable element in the flora of the eastern Maine coast is subarctic, and since Labrador has a still more arctic flora, the obvious thing to do would be to go to a point midway between Cutler and the Labrador coast. Measurement on a map and railway time-tables soon showed us that Bathurst, New Brunswick, was to be the magic spot. So we were soon established at Bathurst. A few days in that flat region, without obvious heights and with great fields of cultivated hops, was an eye-opener; a relatively southern flora, shared with adjacent stretches near the southern coast of Bay Chaleur and for some distance to the south.

Since Emile Williams was born in France, partly of French stock, with a great love of that country, I was inclined to jeer him for imagining that the flora around the Bay Chaleur ("Baie des Chaleurs" of Cartier, its discoverer) would be subarctic. But there we were, surrounded by many of the most common and usually ignored species of eastern Massachusetts, several of them, naturally, here reaching or approaching their northern limits. *Lophotocarpus spongiosus*, *Scirpus maritimus* var. *Fernaldi* and *Tillaea aquatica* were in the saline marshes of the region and sharing the salt-marshes with them was a very striking extreme of *Aster subulatus*, the isolated endemic var. *obtusifolius* of a coastwise species which reaches its limit of continuous range (north from Florida) on the marshes of southernmost Maine. On the dunes and sands, similarly, the southern *Lechea maritima* (eastern Virginia to southern Maine) was represented by the isolated and likewise endemic var. *subcylindrica.*

Chagrined that our confident expectation of a subarctic coastal flora was completely thwarted, we did not fully grasp the significance of our discovery, that the south side of the Bay Chaleur has a relatively southern, rather than northern, flora, although, later on when the full significance of this condition was realized, I urged my student, now Dr. Sidney F. Blake, to carry on the study of the region east, west and south of Bathurst in 1913. His important and significant results appeared in Rhodora, xx. 101–107 (1918) and in subsequent notes. Blake recorded several additional species which "find their northern limit" in northeastern New Brunswick, these extending north from Florida, Georgia, North Carolina or Virginia and here noted under their

now accepted names: *Juncus effusus* var. *solutus*, *Myrica pensylvanica*, *Comptonia peregrina*, *Betula populifolia*, *Quercus rubra*, *Amelanchier stolonifera*, *Samolus parviflorus* and *Teucrium canadense*, further evidence that the flora of the southern coast of Bay Chaleur or areas adjacent is not boreal. Most of the region visited by Blake is covered by outwash-sands and -gravels of glacial origin, but the extreme outer limits lie beyond the glacial gravels. There he got two plants of the utmost significance: *Atriplex sabulosa* Rouy (*A. maritima* E. Hallier, not Crantz), discussed by Blake in RHODORA, xvii. 83–86 (1915) and its range (wholly outside the limit of glacial outwash) shown by me in Proc. Internat. Congr. Plant Sci. Ithaca, N. Y. 1926, ii. 1501, 1503 (map 32a) and 1504 (map 32b); and a local variety (var. *contiguus*) of the strangely isolated endemic *Aster laurentianus* of unglaciated spots about the Gulf of St. Lawrence, a map of which closely resembles the American map (32b) of *Atriplex sabulosa*.

Returning to Williams's and my disappointment of 1902, we will pick up that thread. Across the Bay the skyline was much higher and, since we still had a subarctic flora on our minds, we began to be interested. Consulting a map, we discovered that we were looking across to the southwestern base of the Gaspé Peninsula. Recalling that somewhere on that to botanists little-known land some interesting plants had once been found, we decided to try our luck. At that time the Atlantic and Lake Superior Railway had its western terminus at Matapedia, at the junction of the Matapedia and Restigouche Rivers and at the head of the Bay, its eastern terminus at New Carlisle, county-seat of Bonaventure County, Quebec. Breakfasting in the early morning on the slaty ledges by the lower Restigouche, with *Ulmus americana* overhanging us and tall stinging plants of *Laportea canadensis*, northernmost member of a chiefly tropical genus, suddenly bending toward us in the breeze, we could not feel that we were approaching the Arctic! But we went on to New Carlisle, secured comfortable quarters and a wide-awake hibernian driver, Lawrence, and began exploration by wagon, westward to the great arbor-vitae swamp at the mouth of Bonaventure River, eastward to the mouth of Port Daniel River.

Botanical thrills were, unfortunately, few. The best discovery was, perhaps, *Salix myrtillifolia*, a beautiful shrub of arbor-vitae swamps, here found for the first time east of the Cordilleran region. In similar habitats the cottony-white *Salix lanata* was abundant. One of the most conspicuous members of the genus, it was new to our experience, for it is so fastidious as to avoid much of New England. Abounding in calcareous areas centering on the Gulf of St. Lawrence, it is unknown in New England except in the more northern and western areas of limestone. *Collomia linearis*, primarily western, was new to us, and we were surprised to find *Polygonum viviparum* growing at sea-level; and on the great beach at Paspébiac Point we were delighted with a wholly strange *Agropyron*, typical long-spiked *A. trachycaulum*, the first (but not the last) from east of western North America. Here also was a strange *Draba* with very large fruit, the type-series of *D. glabella*, var. *megasperma*, and we had the satisfaction of seeing for the first time so far south *Euphrasia arctica* and the tiny *Plantago juncoides*, var. *glauca*. A few weeds were interesting: *Hyoscyamus niger* was too abundant, the poisonous slime of the plant making us cautious about picking late strawberries; and *Geranium pratense* was more or less abundant from New Carlisle to Port Daniel. Near the latter village Williams and I got out to look over a salt-marsh. We had hardly ventured in before the owner came to drive us out of his "hay-field". After some explanation, he consented for one dollar to let us look it over—for nothing of significance. But Lawrence's Irish was aroused. As we were leaving he rose full-height in the wagon and shouted for all Port Daniel to hear: "Folks down here is so mean they'd skin a lice to get his taller". At least, we had a loyal escort through the country.[5]

[5] One incident of much stronger savour than Lawrence's thrust was too absurd to be forgotten. Williams, then a prosperous bachelor, proprietor of an expensive and fashionable store in Boston, was an epicure. His bachelor-dinners were famous for the remarkable and delicious dishes (largely or wholly prepared by himself). Probably he had never dealt with dried salt cod. At any rate, slightly east of New Carlisle the gravel-beach of Paspébiac was white for many acres with drying salted cod. Suddenly Williams recalled that Dr. Kennedy, telling of a sailing trip he once took to Chaleur Bay, had repeatedly expressed his regret that they could not land and get one of those beautiful white fish. I, too, had heard the Doctor express his yearning for one. So, now his life-long ambition was to be fulfilled. Going to the great warehouse, Williams dramatically told the story to the manager of the great fishery. With characteristic kindness he consented to help in the mission.

All in all, about what we accomplished was the slight extension northward (not southward) of the then known ranges on the continent of many species which abound in New England: *Juniperus communis* var. *depressa, Sagittaria latifolia, Spartina pectinata, Eleocharis intermedia, Carex projecta, C. Bebbii, C. Buxbaumii, C. debilis* var. *Rudgei, C. hystricina, Corallorhiza maculata, Liparis Loeselii, Rumex mexicanus, Epilobium strictum, Sium suave, Apocynum androsaemifolium, Scutellaria lateriflora* and *epilobiifolia, Lycopus americanus, Chelone glabra, Galium trifidum, Viburnum cassinoides, Solidago flexicaulis, Aster macrophyllus* and *cordifolius* and scores of others. We returned home with a feeling that at least the southwestern region of the Peninsula (Bonaventure County) was most ordinary, and our dream of a subarctic flora there was dissipated. Accordingly, we abandoned any thought of returning.

Suddenly, however, the scene shifted. Two enthusiastic field-botanists who thought themselves acute had, by horse-and-buggy botanizing, failed in a cursory trip along the southern coast of more than half of the Gaspé Peninsula, to find much of anything which would induce them to return. Then, suddenly, a kind friend of the writer, who had no herbarium and had not previously collected plants, started the sensation. The late George Henry Richards (1838–1922), joining his friend, Louis Cabot of Boston, then the owner of the seigniory of Grand River in southern Gaspé County, for salmon-fishing and remembering my earlier interest in the general region, collected a few samples for me in July of 1903. This little package was,

Going outside, he waved his arms and pronto! all the hundreds of men and women ceased work and vanished from sight. Then Williams picked out as plump and juicy a morsel as could be found among the acres of drying fish and asked the price. "I will have to figure it; we usually deal in wholesale lots," was the response. Returning to the office and figuring, the result was worked out: "four cents, please." Carefully wrapped, the prospective gift was hidden in Williams's trunk, in order that the chamber-maid might not be surprised. Now it so happened that at this period the proprietor of the hotel went on a three-day debauch. Hopelessly intoxicated and trembling, he was pitiable, and service became disorganized. On the third evening, returning from a day in the field, we were greeted by a most disgusting odor as we entered the door. "There," said Williams, "the poor devil has wrecked the toilet; we must get out of here"; but, entering our own room, we immediately knew the source of the latest trouble. The foul thing was smuggled out in the darkness of night. Two days later we reached the ultra-fashionable Chateau Frontenac at Quebec; and before Williams's return to Boston the trunk and its contents were disinfected and deodorized. Dr. Kennedy never had a codfish from Paspébiac Beach.

indeed, an eye-opener: an undescribed species of *Comandra*, which was later published as *C. Richardsiana;* a new *Amelanchier,* the later-distinguished *A. gaspensis,* now known to have a wide northern range, chiefly on calcareous soils; a strange little *Orobanche,* which, when abundant material became available, was described as *O. terrae-novae,* a species of calcareous slopes or mountains, either in the open or under *Picea glauca,* in western Newfoundland, on Anticosti and in Gaspé and Rimouski Counties, Quebec, whereas the more southern and technically quite different *O. uniflora* (southwestern New Brunswick to Montana, south to Florida, Mississippi and Texas), is a plant of deciduous forest and less calcicolous.[6]

He also had an amazing series of novelties in the genus *Anemone* (the new *A. multifida,* var. *Richardsiana* and some novel color-forms) and the first recognized American material of *Taraxacum lapponicum.* Obviously Williams and I had seen only the uninteresting and much cleared and pastured exterior. From June 30 to July 3, 1904, I joined Mr. Richards as Mr. Cabot's guest at the fishing-camp some miles up Grand River.

While waiting on the morning of June 30 for the canoeman from up-river, I found, near the house, a wonderful little marl-bottomed bog. Here was a thicket of the lustrous-green *Salix myrtillifolia* again, and sharing the margin of the bog two strange willows: *S. candida,* not at all candid, for it was the rare green-leaved forma *denudata,* from our only Gaspé station; and the *S. humilis,* instead of having leaves narrow and grayish-pilose beneath, had the obovate blades half as broad as long and as white-tomentose as *S. candida* should have been, the first evidence so far east and our only station on the Peninsula of *S. humilis* var. *keweenawensis.* Beyond the thicket the bog was beautiful with the deep red flowers of *Rubus acaulis,* our only station in southern Gaspé; and here were *Carex livida* var. *Grayana* (otherwise known in southern Gaspé only on marly bogs at Bonaventure River) and the very definite *C. lepidocarpa,* a species known outside Europe only about the Gulf of St. Lawrence and Lake Mistassini. It was too early for most bog-plants but, obviously, this little bog needed watching.

As already noted in the sketch, *Incidents of Field-work with J.*

[6] For some detail see RHODORA, xxxv. 308 (1933).

Franklin Collins,[7] up-river botanizing was restricted to a few spots where my host wished to fish, he fearing that otherwise I might be noisy and disturb the salmon. Consequently, many spots which looked like the best botanizing-grounds along the steep-walled little (not very "grand") river were untouched. Nevertheless, the discoveries were remarkable. The general flora was Canadian (we were not seemingly in eastern Massachusetts), with the typical eastern Canadian plants of rich woodland and calcareous slopes and shores: *Selaginella selaginoides, Poa alpina, Carex vaginata* and *scirpoidea, Tofieldia glutinosa, Calypso, Cypripedium Calceolus* var. *parviflorum, Salix glaucophylloides* and *pellita, Anemone riparia, Dentaria diphylla, Draba arabisans, Viola nephrophylla, renifolia* and *Selkirkii,* etc. But mingled with these always interesting Canadian species in the unspoiled woods or on limy bluffs or shores there were others which greatly excited me. The leafy Yellow Violet, *Viola pensylvanica* var. *leiocarpa,* there seemed to have got too far north, although we now know it to be the more northern extreme of a relatively southern species; and *Polygala paucifolia* (the only time I ever saw it so far north) seemed out of place. But plants I had never before met were the great source of thrills. *Valeriana septentrionalis* was on the seeping banks with *Anemone parviflora, Thalictrum alpinum* and *Listera auriculata;* the beaches were carpeted by the northern cordilleran *Dryas Drummondi* and here and there tussocks of the likewise supposedly Rocky Mountain *Sisyrinchium montanum.* Dry rocks or rocky slopes bore *Carex concinna,* new to me; rich but not too wet banks were carpeted with *Cystopteris montana, Osmorhiza obtusa* of the Rockies and *Lycopodium sabinaefolium* var. *sitchense.* These and many others, mostly new to my experience, made me wish that Emile Williams could see a bit of this unspoiled Gaspé; but the great prizes were, of course, abundant colonies of the new *Comandra* and Mr. Richards's new red Anemones, and two very distinct native Dandelions; the local and large-headed species later described, from abundant material from northwestern Newfoundland, as *Taraxacum Longii;* and the small-headed *T. ceratophorum* (with utterly different achenes), which later proved to be rather general on the Gaspé limestones. *Senecio aureus,* too,

[7] RHODORA, xliv. 98–147, with 12 plates (Contrib. Gray Herb. no. cxl.), where some details of several explorations of the Peninsula are given.

seemed very strange, two different leaf-variations which I had never before seen: var. *semicordatus*, subsequently found westward to the lower Restigouche, and the then undescribed northern var. *aquilonius*. As if these excitements were not sufficient, *Arnica*, which I had always known only through *A. mollis*, with subplumose tawny pappus, here had very narrow leaves and barely barbellate white pappus, the original collection of *A. chionopappa*, which subsequently proved to be a characteristic species on calcareous slopes near sea-level in Gaspé and western Newfoundland. Then, the only representatives of *Antennaria* seen along the river were a peculiar extreme of *A. neodioica*, the new var. *interjecta*, afterward found to be more characteristic of calcareous ledges of Rimouski County, and another, suggesting *A. canadensis* but with more or less flagelliform stolons and with most of the cauline leaves with elongate pale appendages, the type-series of the new *A. appendiculata*, a calcicolous species subsequently found on the limestones of western Newfoundland, Anticosti Island and near the foot of James Bay—thus having a real range.

It was as difficult to leave such a rich area, with a new discovery at every turn, as it had been easy for Williams and me to abandon the region slightly to the west after our disappointing experience of two years earlier. Now it was clear that, as soon as the beaten roads, cleared farms and pastured roadsides (for cattle wandered unfenced along the roads) were left behind, Gaspé would prove to be a land of botanical surprises. But appointments with the Josselyn Botanical Society of Maine took me to Fort Kent and St. Francis in northern Maine, there to discover the endemic *Carex Josselynii* and the original station for *Viola novae-angliae*. However, later in the summer, stimulated by my brief Grand River experience, the late Professor J. Franklin Collins and Professor Arthur Stanley Pease joined me in a gradual return to Grand River and points beyond. The high lights of this and later trips with Collins and Pease or with Collins or other companions have largely been noted in the sketch already referred to. Certain botanical observations and records of interest were there necessarily omitted. Several requests for fuller lists of significant species and their localities having come to me, I am here refreshing my memory and somewhat supplementing the memoranda already published.

On the way to Grand River in late June, I had spent a day or two looking over the country from Matapedia to Escuminac; and on the way toward Carleton, where we were to be joined by Pease, Collins and I utilized a couple of days in further checking the plants of this southwestern corner of the Peninsula. As was the case when Williams and I were there, most of the specialties were relatively southern species, but a few were of more interest to us. Reaching Matapedia long before the start of the train eastward, we made as complete a survey of the lower Restigouche there as time and the earliness of the season allowed. A few additional northern limits in this direction were noted (some of the northeastern ranges later extended eastward). *Veratrum viride, Cornus rugosa, Apocynum medium* and *sibiricum, Lilium canadense, Carex aurea* and *gracillima, Potentilla arguta, Prunus depressa* and *Osmorhiza longistylis,* not noted by Williams and me, were quite reminiscent of New England; but, giving a more northern calcicolous aspect, were other natives which are unknown in New England or are there confined to the higher or more northern areas: *Poa alpina, Carex capillaris* var. *major,* the later-described *Allium Schoenoprasum* var. *laurentianum, Astragalus eucosmus* and *alpinus* var. *Brunetianus, Oxytropis johannensis, Hedysarum alpinum* var. *americanum, Osmorhiza chilensis, Castilleja septentrionalis, Pinguicula vulgaris, Erigeron hyssopifolius* and *Prenanthes racemosa.*

Best of all, here were two of the red-flowered Anemones of the Grand River ledges and five species which neither of us had ever met before: *Scirpus rufus* var. *neogaeus* and *Carex bipartita* var. *amphigena,* a strange *Salix* which we subsequently found in better condition at the mouth of Grand River, the new *S. paraleuca,* a strange new *Antennaria, A. rupicola,* and a peculiar villous-hirsute and tiny-headed extreme of *Hieracium canadense,* the still rather anomalous var. *hirtirameum.* In a couple of hours the banks of the lower Restigouche at Matapedia had yielded almost as many plants of interest as Emile Williams and I could turn up at the same season of the year on our disappointing "horse-and-buggy" trip of two years before!

We took the train only a few miles, to the village of St. Jean l'Évangeliste, near the mouth of Nouvelle River, and spent the day driving some distance up the river, the shores of which, so

far as we went, had been denuded by glaciers and were boulder-strewn and of somewhat acidic or noncalcareous rock. Consequently, the typically calcicolous plants of the lower Restigouche were lacking. Instead, the vegetation was, like so much which Williams and I had encountered, tediously uninteresting to a New Englander; mostly the common plants of the less fertile sections of that region. To a great extent, however, they were here at or near their northeastern limit (except near the River St. Lawrence), on the continent and, on that account only, the following are enumerated: *Scheuchzeria palustris* var. *americana, Scirpus americanus, rubrotinctus, atrovirens* var. *georgianus* and *pedicellatus, Eriophorum tenellum, Carex rosea, Crawfordii, tenuiflora, communis* and *hystricina, Salix Bebbiana, Populus tremuloides, Alnus rugosa* var. *americana, Nuphar variegatum, Ranunculus recurvatus, Clematis virginiana, Sarracenia purpurea, Amelanchier laevis, Rhus typhina, Acer rubrum, Epilobium leptophyllum, Cicuta maculata* and *bulbifera, Sium suave, Pyrola elliptica, Kalmia angustifolia, Gaultheria procumbens, Vaccinium myrtilloides, Convolvulus sepium, Lycopus uniflorus, Utricularia vulgaris* and *cornuta, Galium asprellum, Diervilla Lonicera* and *Hieracium scabrum.* Nothing could be more tediously uninteresting to one who is familiar with the common run of plants southward or westward, but a few species along Nouvelle River kept us from being too much bored. Here was the slender-fruited extreme of *Carex flava,* later to be seen along other rivers, the rather localized var. *gaspensis;* and *Poa irrigata* Lindm. (in a sphagnous spruce-swamp), *Luzula pallescens* and *Gnaphalium sylvaticum,* all afterward found farther to the east, were the first known outside Eurasia; while the continental *Trillium erectum* we never again met on the Peninsula.

Reaching Carleton, we had our trunks unpacked and the work-room in order when Pease arrived. The main incidents of the really thrilling remainder of the summer have already been published in the paper on field-work with Collins and may not here be repeated, but for completeness of the record some significant plants, mostly not there enumerated, are here noted. The area about Carleton has three strikingly contrasted physiographic or phytogeographic divisions: the flatter country, very slightly glaciated, with calcareous soils and several limy arbor-

vitae swamps; the long flat Tracadigash Point, a great expanse of gravel extending far out into the Bay Chaleur; and, some miles back, the precipitous-topped and sharp-prowed mass of Tracadigash Mountain, rising far above the glaciated lowland base and reaching a height of 1930 feet, as determined by Collins's aneroid.

The woods or adjacent clearings were the homes of *Polystichum Braunii* var. *Purshii, Poa saltuensis* var. *microlepis, Sphenopholis intermedia, Carex Deweyana, Goodyera repens* var. *ophioides* and *tesselata, Polygonum cilinode, Actaea rubra, Geranium Bicknellii, Aralia racemosa, Pyrola asarifolia, Galium Aparine, Solidago canadensis* and the other characteristic plants of such habitats generally in the northeastern United States and adjacent Canada. In the low depressions were found *Eleocharis elliptica* and *pauciflora* var. *Fernaldii, Juncus Dudleyi, nodosus, alpinus* (typical) and its var. *rariflorus, Parnassia parviflora* and other wide-ranging species. In the arbor-vitae swamps various nice sedges and such distinctive plants as *Orchis rotundifolia, Malaxis brachypoda, Salix lucida* var. *intonsa,* a very pubescent-leaved gooseberry (*Ribes hirtellum* var. *calcicola,* also on the seepy limy slopes of Tracadigash Mountain and its type from the marly arbor-vitae swamp at the mouth of Bonaventure River) and *Senecio indecorus,* all plants of wide general northern distribution.

It was the gravels and turf of extensive Tracadigash Point and the steep slopes, talus and cliffs of Tracadigash Mountain which supplied the striking species. Taking in systematic sequence the specialties of Tracadigash Point, we begin with the type-collection of *Puccinellia laurentiana,* a local species of maritime habitats of eastern Quebec and adjacent New Brunswick, typical *Agropyron trachycaulum* (already noted from Paspébiac Beach), *Zigadenus glaucus,* largely confined to the St. Lawrence basin, the type-collection of *Arenaria litorea,* a species which later proved to be inseparable from *A. dawsonensis,* described from northwestern North America but now known to be essentially transcontinental, *Stellaria longipes* (the pale and dwarf form known as var. *laeta* (Richards.) T. & G.), *Thalictrum confine, Arabis brachycarpa* (then the first from eastern North America but now merged with *A. divaricarpa* and known to be transcontinental northward), the type-collection of *Viola adunca,* var.

glabra (now known by an earlier varietal name, var. *minor* and also known to have a boreal transcontinental range) and *Achillea lanulosa*, another transcontinental species which follows the coast southward to New England. Tracadigash Point was, at that time, pretty thrilling but its specialities have mostly proved to have broad and subcontinuous boreal distribution.

Quite as interesting an area near Carleton is Tracadigash Mountain. Rising more than 600 feet above the slightly glaciated foreland, its steep slopes and upper calcareous cliffs are the home of the chiefly western *Collomia linearis*, *Poa Canbyi* (in this area and in the Lake Superior region isolated from the Rocky Mts.), *Carex praticola* (boreal, with greatly disrupted range), *Goodyera oblongifolia* (its areas likewise disrupted, with gaps of many hundreds of miles in its transcontinental range) and *Hackelia americana*, then unknown from east of western North America. Along with these more interesting species were others of more local interest: *Dryopteris fragrans* var. *remotiuscula*, *Polystichum Lonchitis*, *Carex Eackii*, *Smilacina racemosa* (only time seen on the Peninsula), *Clematis verticillaris* and *Corydalis sempervirens*. Tracadigash (or Carleton) Mountain is really the southwestern end of a high range of low mountains which there swings to the west but eastward reaches the Grand Cascapedia and follows up that valley, the range having a length of about 40 miles. We merely touched it. Exploration of the high unglaciated crest would yield other fine specialties.

"A range of low mountains runs northeast and southwest along the west side of Cascapedia bay at a distance of 2 or 3 miles from the shore, and then bends westwards at Carleton, where some work was done. A good path leads up Carleton mountain, whose height is given as 1,830 feet, the lower part being of slate and the highest point consisting of weathered diabase or porphyrite. A certain amount of drift was seen up to about 1,200 feet, where boulders of a basic eruptive occur resting on the slate. Whether these are ice transported is uncertain, since they may have come from the highest summit, perhaps a mile to the east, though there is a slight depression between. If they were ice-borne this is the highest point at which glacial work has been found on the southern side of Gaspé. No granites, serpentines, or hornblende schists, such as might have come

from the Shickshocks, were seen; and probably these mountains were never crossed by a glacier moving southwards."[8]

With limited time and the urge to reach Grand River, we had to be selective. The broad Grand Cascapedia River, rising far to the north and flowing past several isolated and very alluring mountain-masses, was obviously too much of an undertaking. So we went on to New Richmond, thence to be driven as far as a road would take us up the valley of the Little Cascapedia. Then we went on by canoe as far up-stream as Brûlé Brook. The Little Cascapedia strongly resembles Grand River, really a very narrow or tiny river shut in by steep walls and cliffs, with none of the scoured and smoothed characteristics of a glaciated valley; and the flora was largely a repetition of that of Grand River; the beaches carpeted with *Dryas Drummondii* as handsome a ground-cover as could be imagined, and with another indigenous Dandelion, *Taraxacum lapponicum*.[9] But the margins of the beaches were characterized by a handsome pale-flowered and very distinct *Astragalus*, the later-distinguished *A. frigidus* var. *gaspensis* (its type from this valley); and the chiefly northwestern and densely white-woolly *Solidago hispida* var. *lanata* abounded. Another plant in the gravel was definitely not the common thick-leaved and everywhere naturalized *Plantago major*. Its small and smooth leaves were very thin and erect, its capsules tapering to summit, its seeds small, *P. major*, var. *Pilgeri*, now known in natural habitats across the continent. At the borders of the beach or on the slopes the chiefly cordilleran *Lonicera involucrata* abounded and here was a *Cynoglossum* which was certainly not the lilac-flowered *C. virginianum*. This more delicate plant had the much smaller flowers with clear blue corollas, the type-

[8] A. P. Coleman. Physiography and Glacial Geology of Gaspé Peninsula, Quebec, 25 (Geol. Sur. Can. Bull. No. 34—Geol. Ser. no. 41 (1922).

[9] When in Rhodora, xxxv. 383, 384 (1933) I cited *Taraxacum lapponicum* Kihlman (1884) as occurring in "Arctic and subarctic Eurasia and North America, south to Newfoundland and eastern Quebec" and placed in its synonymy *T. croceum* Dahlsdt. (1900), I received a prompt reprimand from a Scandinavian botanist because, he said, *T. croceum* is absolutely different. Dahlstedt, himself, to whom I referred our collections, seemed, however, as quoted by me in Rhodora, l. c. 122, to consider them conspecific in November, 1927, he then writing: "It has been very interesting to find that *T. lapponicum* (= *T. croceum* Dt.) is distributed also in arctic North America. This collective species . . . is widely distributed in northern and alpine parts of Fennoskandia and occurs also on Iceland and Greenland. It seems to me to be a very old species which surely inhabited the recently covered countries long before the last Skandinavian glaciation."

colony of the new *C. boreale.* Some species which we had thought of as alpine or subalpine were here near sea-level, *Carex atratiformis* and *Epilobium Hornemanni* for example; while others were here near or at their northeastern limits on the continent: *Alopecurus aristulatus, Carex abdita, Asarum canadense, Erigeron philadelphicus,* etc. Here for the first time in the summer we had a good opportunity to collect aquatics in quiet pools, such plants as *Sparganium chlorocarpum* var. *acaule, Potamogeton filiformis* var. *borealis, Sagittaria cuneata* and *Ranunculus subrigidus.* Our greatest delight, perhaps, was finding on the dripping limy walls, the northwestern American and northeastern Asiatic *Parnassia Kotzebuei,* a species heretofore known in eastern America only in Greenland. We greatly regretted the necessary briefness of our slight checking of the Little Cascapedia but we had to be moving. Brother Victorin and his companions later did a more thorough piece of exploring there.

The next stop was at the mouth of Bonaventure River, compared with the Little Cascapedia a very large stream with broad brackish and saline marshes and extensive limy arbor-vitae swamps at its mouth. This region was so fascinating and our host so accommodating that we spent three days (August 2–4) near the shore and three others (Aug. 5, 6 and 8) on the river. Such vast collections were made that more than half the time was used in caring for the presses. The marly arbor-vitae swamps about the mouth of the river and for some miles to the west gave us most of the species of such habitats which had previously interested us. In addition these limy and damp woods and their openings yielded several which we had not been seeing: *Sparganium minimum* in rills, our only Gaspé station; *Agropyron trachycaulum* var. *majus* and *Muhlenbergia glomerata* var. *cinnoides; Rhynchospora capillacea* at the only station we know on the Peninsula, a very distinct species which is highly localized as far to the northeast as Gaspé and western Newfoundland; *Carex hormathodes* (only a few stations so far to the north); the type-collection of *Juncus balticus* var. *stenocarpus; J. stygius* var. *americanus* (later found in the bog at Grand River but very rare in southern Gaspé); the equally local *Salix pyrifolia;* our only colony in southern Gaspé of *Betula pumila; Geocaulon lividum; Polygonum viviparum* var. *alpinum,* our first recognition of it in

America; *Stellaria crassifolia* on submerged bogs and knolls, a species which in eastern Canada seems to prefer the coast of the Gulf of St. Lawrence; *Ranunculus pensylvanicus* at our only Gaspé station, there associated with the reputedly western *R. Macounii*, so that we had an opportunity to contrast the two; and *Pyrola asarifolia* var. *purpurea*, the only time we saw it on the Peninsula. Here we suddenly recognized that the triple-nerved goldenrods of eastern Canada could not all be crowded into *Solidago canadensis* and *gigantea*. Here was another species, heretofore supposed to belong in the western part of the continent, *S. lepida*. The plant on the alluvium of Bonaventure River is var. *fallax*, the most widely dispersed variety, but other striking variations of the species were soon to be discovered. Brother Victorin and his companions subsequently explored this area and they here got the new *Gentiana gaspensis*, isolated member of a complex and nearly transcontinental series of technical species; unfortunately, we were too early for it.

The brackish marsh had some of the preceding species, but mostly another series. Further exploration of it would yield several more, but here were the first *Catabrosa aquatica* var. *laurentiana* we had ever seen, the type-colony of *Eleocharis halophila*, the rather local *Scirpus acutus*, the second Gaspé station for *Carex livida* var. *Grayana* (of broad Canadian range but, rather singularly, isolated in southern New Jersey) and the type-colony of *Galium trifidum* var. *halophilum*. Suddenly we became conscious that *Bidens* was in this saline or subsaline marsh, surely the wrong habitat for any species we had ever seen; but examination showed that the achenes were abundantly striate on each of the two flat faces. It did not fit anything we knew. This was our first (but not the last) encounter with the then almost unknown *B. hyperborea*, which had three years earlier been described from the foot of James Bay. Our plant was var. *laurentiana*, later found in brackish soil from eastern Gaspé to the lower Restigouche and beyond.

Bonaventure River, above the great marshes at its mouth, is one of the big rivers of the region, broad and shut in by steep walls of calcareous rock, largely red conglomerate. We were so fascinated by its flora that we made slow progress and barely reached the base of Baldé. To be sure, most of the notable

plants were those already seen, either from the banks and beaches of Grand River or from the Little Cascapedia, but we were still enthusiastic over such distinctive species as the *Parnassia* and the two *Astragali;* and the masses of *Dryopteris Robertiana,* hanging from ice-cold and dripping walls, gave us a new thrill, as did *Carex Garberi* var. *bifaria,* great masses of the type-colony of *C. flava* var. *gaspensis,* our only station on the Peninsula for the southern *Trillium undulatum,* the type-colony of *Amelanchier gaspensis,* and, on the beaches, such plants as *Equisetum variegatum* var. *Jesupi* (the only time seen) and *Agropyron trachycaulum* var. *novae-angliae.* The dripping walls, where so many fine things were growing were often covered with very loose and intricately forking mats of *Arenaria dawsonensis,* the plant I had described from the open and sunny beach at Carleton as *A. litorea.* Very recently Boivin in Nat. Canadien, lxxv. 216 (1948), has set off *A. dawsonensis* var. *litorea* because of its compact habit and dwarfness. Had he seen, in the same geographic region, that the type-colony was a xerophytic one, the type-sheets contain 10 and 13 individual plants, while on more sheltered and wet slopes the individual plants are so lax as completely to cover a standard herbarium-sheet, he would have recognized ecological responses only.

We were forced to remember that the little steep-walled valley of Grand River was our important objective. It was now close time on salmon-fishing and Mr. Cabot had provided me with a letter, directing his warden to take us wherever we wished to botanize up the fascinating valley, the type-region of several notable plants. But, alas, although we had reckoned with our host, he had not reckoned with his employe. Arriving at the mouth of Grand River, we learned that the warden was up-river and beyond reach, with a group of county-officials "enjoying forbidden fruit". After some days of waiting we moved on and the most promising valley of the river still awaits midsummer and autumn exploration.[10] During the hopeful waiting for our guide we dared not wander far away. The little marl-bog was, naturally, revisited. *Rubus acaulis* was now mature, with

[10] On later trips on the Peninsula we were reminded of the officers of the law who had thwarted us, for it soon became quite evident that, after the closed season on shooting caribou had come, various game-wardens and licensed guides lived largely on "mountain mutton."

lusciously wine-like fruit, and with it another of the same subgenus, our first collection of *R. arcticus*. *Carex chordorrhiza*, our only Gaspé collection, sprawled over the other vegetation, its prolonged stems sending up from their axils the fruiting culms, a most unusual habit in the genus; and here was another station for the rather local *Juncus stygius* var. *americanus*. Best of all, the lower part of the bog was a carpet of three sundews: the somewhat ubiquitous *Drosera rotundifolia* and our first colonies of *D. anglica* and *linearis*, the two latter never again met by us in Gaspé. Another marly and inundated spot was the peaty margin of Trout Pond. Here the great prizes were a tiny little bedstraw, the type-colony of *Galium brevipes*, a species subsequently found westward to the Lake Superior region and, so far as we yet know, isolated in Greenland. With it was the remarkable *Drosera rotundifolia* var. *comosa*, tiny plants with flowers replaced by tufts of leaves, these dropping off and reproducing the colony vegetatively.

We attempted to follow up-river on foot, but that project proved too difficult. At the mouth of the river, however, there was a fine clump of what seemed like a strange willow. This proved to be the new *Salix paraleuca*, a local species subsequently found on the Côte Nord. Otherwise, we had to content ourselves with the more open country back of the coastal bluffs. The latter, consisting of red sandstone and conglomerate were deeply undercut by the waves and one had to be cautious about approaching the edge, which frequently collapsed. Along this treacherous front we found the northernmost extreme of *Lobelia spicata*, the var. *hirtella*, this being our only Gaspé station for it; but our attention was chiefly absorbed by two asters which were new to us. One, abundant, was the type of *Aster foliaceus* var. *subpetiolatus*, thus far known only about the Gulf of St. Lawrence; the other, less abundant, the type of *A. foliaceus* var. *crenifolius*, a plant which, later, was called *A. crenifolius*. The latter was so near the treacherous overhang that it is feared that the colony has gone into the sea.

Moving on to the east, our next base was at Percé, now a tourist-resort, but then in its primitive state as primarily a great

cod-fishery.[11] The details of our brief stay there, the unsavory living-conditions but the stimulating discoveries have already been published in the paper on field-work with Collins and should not be repeated here. A few additional plants of special interest may, however, be noted. We had followed the coastal peaks and cliffs as far north as the beginning of the Grande Coupe and westward to Cap Blanc. Practically all rills and natural swales were inhabitated by *Glyceria fluitans*, the typical plant of Eurasia and apparently native here. Many of the calcareous walls and slopes bore *Hackelia americana* which we first saw near the summit of Tracadigash Mountain; and *Polystichum Lonchitis*, extremely variable in size in response to aridity or moisture abounded. *Calamagrostis inexpansa* var. *brevior* was common, but here were the only colonies we have ever met in Gaspé of two common species farther south and west: *Juncus articulatus* in a wet depression; *Luzula acuminata* in woods on Mt. Ste. Anne, where subsequent botanizers have also got it. From this first visit to Percé we brought away the types of 3 new species, 5 new varieties and several new forms. These all came from the higher crests, walls or mountains, this area thus characterized by Coleman, l. c. 23:

"From Corner of the Beach a road follows the shore southeastward to Percé, rising on terraces up to 225 or 230 feet, and then passing over hills. Blocks of granite and gneiss were seen above this, and a gneiss boulder 3 feet long was observed at 262 feet above the sea, indicating that floating ice must have reached this level, which is about 20 feet above the highest marine terrace indicated by Chalmers and Fairchild.

Except a little boulder clay on the road southwest of Percé no evidence of glacial action was seen, and the mountain having an elevation of 1,230 feet as shown on the map, must have risen above the [floating] ice."

From Percé we drove to Douglastown on the west side of Gaspé Bay, stopping on the way beyond Corner of the Beach on the beach –or "barachois") and brackish pond-like lagoon back of the Barachois de Malbaie. Here was a very interesting habitat, which will repay further exploration with a boat, which,

[11] The long-established French names (some coming down from the discoverer, Cartier) Les Murailles, Cap Rouge, etc., were in use. Several years later, after the automobile-road around the Peninsula was made, the road soon lined with tourist-homes, up-to-date eating-places, etc., I arrived in Percé, to be greeted by a tourist with "Which is the Peak of Dawn?" Inquiry disclosed that it was good old Mont Rouge, which, with all its neighbors, had lost its identity.

in our migration, we did not have time to do. This region was covered by shore-ice during the Pleistocene and we did not get above the old marine shelf. The striking feature of the flora of this old sea-margin was, therefore, the complete lack of the plants which had been interesting us. My daily records of all plants seen cite none of those fascinating species. Instead, the most interesting plants of this shore and the adjacent lagoon were the following: *Typha latifolia* (only two other stations seen by us on the Peninsula), *Juniperus communis* var. *depressa* (ditto), *Potamogeton pectinatus, Calamagrostis canadensis, Deschampsia flexuosa, Spartina pectinata, Scirpus validus* var. *creber, Carex lasiocarpa* var. *americana* and other species which, except for their infrequency in or absence from the area we had been traversing, could arouse no enthusiasm. Here, however, was our first material of *Euphrasia Randii* var. *Rockii* and our first meeting with the arctic *Carex rariflora*, the latter usually an alpine species in Gaspé.

Reaching Douglastown, we did our best to find interesting plants in the immediate region of that town, along the shores of Gaspé Bay, and slightly up the St. John or Douglastown River. But, alas, something had happened; our luck had gone! We might have been in the most ordinary and unthrilling glacially denuded country farther west and south. Most of the plants of Barachois de Malbaie were there and many scores of the same tedious series: *Lycopodium complanatum* var. *flabelliforme, Botrychium multifidum, Sparganium chlorocarpum* (our only Gaspé collection), *Potamogeton perfoliatus* var. *bupleuroides, Sagittaria cuneata, Agrostis perennans, Eleocharis acicularis, Carex canescens* var. *disjuncta, C. silicea* (our only station) and *C. communis, Sanicula marilandica, Plantago oliganthos, Galium tinctorium, Solidago rugosa, Aster radula* and *Prenanthes trifoliata*. We had two days of collecting the common plants of our "home-towns", but did a conscientious job because many of them were not generally distributed over the Gaspé Peninsula. There were, of course, some species novel to us, for a newly explored area rarely fails to have something of interest. Here we met for the first time the halophytic or semihalophytic *Hippuris tetraphylla* and *Plantago eriopoda*, and in the water at the mouth of St. John River the type-colony of *Potamogeton Berchtoldi* var. *colpophilus;*

while in the thickets there was another variation of *Aster foliaceus*, the new var. *arcuans*. Clearings were the home of a strange *Rhinanthus*, which later proved to be rather general southwestward to Percé, the European *R. stenophyllus*, looking native, but possibly merely naturalized.

Moving on to the port of Gaspé Basin in order to catch the next boat westward and homeward we did little further exploring, the flora about the town not specially tempting us. We felt it important to try the lower reaches of Dartmouth and York Rivers, which enter Gaspé Bay from the west. The same luck as at the mouth of St. John River which also enters the Bay from the west: a very small minimum of plants we had been seeing on river-gravels to the west, but the dominating flora was made up of the common plants of much of New England and points south; many of the same uninteresting or (outside Gaspé) ubiquitous species, with, of course, some additions. Characteristic of this to us uninspiring but typical flora of the lower marine terrace about the mouth of the Dartmouth were such plants, well known as far south as New Jersey, Delaware, Maryland or Virginia, as typical *Spartina alterniflora*, *Scirpus paludosus* var. *atlanticus*, *Carex pallescens* var. *neogaeas* and *C. viridula*, *Potentilla fruticosa*, *Myriophyllum exalbescens* and *M. verticillatum* var. *pectinatum*, *Angelica atropurpurea* and *Limosella subulata*, many of these (except the strictly coastal) also of wide range westward. Others reach south to the Carolinas, Georgia or Alabama: such species as *Poa palustris*, *Carex gracillima*, *Rosa virginiana*, *Aralia hispida*, *Lysimachia terrestris*, *Lycopus uniflorus*, *Eupatorium maculatum* and *Aster umbellatus*. Still worse, several others come north from or extend south to Florida, Mississippi, Louisiana or eastern Texas: a group of bourgeois plants like *Onoclea sensibilis*, *Dryopteris cristata*, *Pteridium aquilinum* var. *latiusculum*, *Phragmites communis* var. *Berlandieri* (our only Gaspé station), *Elymus virginicus*, *Leersia oryzoides*, *Cardamine pensylvanica*, etc., etc. These were not the plants we had come to the tip of Gaspé to see and we were not then enthusiastic about them. Only one novelty was seen, another variety of *Bidens hyperborea* of saline soil, the type-colony of var. *gaspensis*.

This essential lack of most of the more interesting and localized plants of the unglaciated or nearly unglaciated areas, like the

summit-cliffs of Tracadigash Mountain, the crests at Percé, the cliffs and shores of the Little Cascapedia and of Grand River, and their replacement by the ubiquitous and aggressive species of broad and usually continuous range westward and southward puzzled and disturbed us, but the solution remained a mystery until Dr. Coleman, studying the area around Gaspé Bay, clearly stated it:

"Boulder clay occurs scantily along the northeast shore of the bay, the stones contained in it being mostly local, though fragments of hornblende schist and of an agglomerate formed of some basic eruptive must have come from the interior.

There are well-marked striae on sandstone near Grande Grève and at other places, the direction being parallel to the axis of the bay.

On the southwest side of the bay, and on the shore of Gaspé basin also, boulder clay is rather common, enclosing only local stones except for some hornblende schists. Striae were found on sandstone on the promontory between the two bays, running southwest, as if the local glacier coming down the Dartmouth valley had spread westwards.

The hill behind the village of Gaspé rises to 477 feet and shows no evidence of ice action, the boulders upon it seeming entirely local. Its summit may have risen above the glacier, which does not seem to have been very thick.

Terraces, usually indistinct, occur at 45, 70, and 180 feet. One or two small fragments of granite or gneiss were found, perhaps rafted round from the Labrador coast when the sea stood higher. Both Chalmers and Fairchild report a marine level at 235 or 240 feet, but this was not observed by the writer, perhaps because not sufficiently looked for.

The glaciers coming down the Dartmouth and York valleys and combining in the basin of Gaspé bay, as suggested by Chalmers, must have been among the most important of the local glaciers or ice-sheets radiating from the mountains, and their effects are more readily recognized than those of the northern glaciers mentioned before."—Coleman, l. c. 22, 23.

From Coleman's statement of the situation it was clear that the glaciated area about Gaspé Bay had largely lost the plants which characterize the unglaciated areas of the Peninsula, but had received the aggressive and rapidly colonizing flora which covers so much of the glaciated regions of the northeastern states and southern Canada. Most fortunately, our conscientious collecting or recording the plants of the region now was producing significant results.

Opposite Gaspé Basin the waste ground and ballast-lands about the great fish-houses at York were the home (at least temporarily) of a great number of adventives. We took samples of all but the commonest weeds of eastern Canada, for several of them were

new to us. We felt as the enthusiasts over ballast-filling farther south in the days of sailing vessels, for, besides such generally naturalized adventives of eastern North America as *Bromus commutatus*, *Urtica dioica*, *Coronopus didymus*, *Diplotaxis muralis*, *Capsella rubella*, *Vicia hirsuta*, *Erodium moschatum*, *Stachys palustris*, *Tussilago Farfara*, *Senecio Jacobaea* and numerous others (several from our only Gaspé station), here was an assemblage of less familiar wanderers, doubtless brought in Transatlantic shipping. Here we made our only Gaspé collections, the species marked with an asterisk the only representatives from Canada in the Gray Herbarium: **Rumex bucephalophorus* L., **Chenopodium Vulvaria*, **Diplotaxis erucoides* (abundant and coloring the area), *Medicago hispida* and **M. sphaerocarpa* Bertol. The *Trifolium pratense* here and at various other localities in the area (on roadsides, etc.) was the dwarf extreme which was new to us, the plants only a few inches high and with small leaves and heads, true *T. pratense* (our var. *frigidum* Gaudin), the taller and larger plant which spreads from cultivation being var. *sativum*.

Thus our summer's botanizing had started without many discoveries on the Prepleistocene coastal terraces of southwestern Gaspé where the evidences of glacial activity down the Matapedia Valley are pronounced (see Coleman, l. c. 25, 26); then it rapidly developed a crescendo as we explored the unglaciated upper cliffs of Tracadigash Mountain, the barely or hardly glaciated narrow and shut-in valley of the Little Cascapedia, and it reached fortissimo on the rugged, ragged and towering cliffs and crests rising high above the but slightly glaciated foreland at Percé; then, with a disheartening dimuendo, we came down from our exalted enthusiasm to the commonplace of definitely glaciated Gaspé Bay, and finally ended our season on ballast-land and rubbish-piles.

ADDITIONS TO THE FLORA OF NORTH CAROLINA[1]

ALBERT E. RADFORD

UNTIL recent years very little work has been done on the vascular aquatic flora of North Carolina. Prior to 1860 a few collections were made by M. A. Curtis. In the herbarium of the University of North Carolina there are several collections of aquatics made in the late 1880's by Gerald McCarthy. In the herbarium of the Academy of Natural Sciences of Philadelphia are a few specimens collected in 1911 by E. B. Bartram and Bayard Long, and in the Gray Herbarium several by K. M. Wiegand and W. E. Manning dated 1927. Since 1938 R. K. Godfrey of North Carolina State College has collected many specimens of aquatics while making general plant collections over the state.

For the past two years I have been collecting and studying the vascular aquatics of North Carolina. During the course of this work I have found twelve species of plants which, so far as I know, have not been recorded previously from the state. Eleven of these are vascular aquatics. Most of the distributional data for these new records are based on my collections of 1949 and 1950. Range data have been obtained also from a study of specimens in the following herbaria: Gray Herbarium, the Herbarium of the New York Botanical Garden, the United States National Herbarium, the Herbarium of the Academy of Natural Sciences of Philadelphia, Duke University Herbarium, North Carolina State College Herbarium, and the Herbarium of the University of North Carolina.

The species discussed in the following paragraphs are deposited in the Herbarium of the University of North Carolina unless otherwise indicated. The genera are arranged according to Gray's Manual of Botany, 8th Edition, 1950; the species within a genus are listed alphabetically. The general distribution data are based on that given by M. L. Fernald in Gray's Manual of Botany, 8th Edition, 1950, and by W. C. Muenscher in his Aquatic Plants of the United States, 1944.

[1] This work was supported by a grant from the Carnegie Foundation for the Advancement of Teaching.

Potamogeton crispus L. Hertford County: in pool at Smith-Douglas Fertilizer Plant on Meherrin Road, near Murfreesboro, June 10, 1949, *L. A. Whitford 108* (N. C. State College Herb.); McDowell County: small stream at State Fish Hatchery, north of Marion, June 8, 1950, *Radford 5281;* Wilkes County: Yellow Jacket Lake, 1 mile southwest of Moravian Falls, September 5, 1949, *Radford 4969.*

Introduced from Europe. Previously reported from Virginia, Tennessee, northeastern and north central states, and as far west as California.

Najas gracillima (A. Br.) Magnus. Jackson County: boggy margin of Cashiers Lake, August 2, 1949, *Radford 4764;* McDowell County: Lake Tahoma, near N. C. Rt. 80, August 1949, *Radford 4870;* Orange County: University Lake, near Chapel Hill, September 23, 1950, *Radford 5480.*

This species is local in the northeastern states and infrequent in the north central states. The range is extended southward from Virginia. It is rather abundant in both Lake Tahoma and University Lake. At Cashiers Lake it was discovered in a collection of *Nitella.* Subsequent search for it at Cashiers in 1950 failed to reveal it.

Lophotocarpus spongiosus (Englm.) J. G. Sm. Hyde County: mud flat near causeway on south side of Lake Mattamuskeet, July 4, 1950, *Radford & Huneycutt 5392.*

Fernald, 1950, reports this species as growing on tidal mud of brackish estuaries from New Brunswick to Virginia. I found a few specimens rather widely scattered over the mud flats of Lake Mattamuskeet. This is a shallow fresh water lake only a few miles from Pamlico Sound. An old canal extends from the lake to the sound.

Wolffia papulifera C. H. Thompson. Perquimans County: pool in cypress swamp south of Newhope, July 7, 1950, *Radford & Huneycutt 5452;* pool in cypress swamp near Pergquimans River, 1½ miles southeast of Newhope, July 7, 1950, *Radford & Huneycutt 5462.*

This species was originally discovered in Missouri, and until recently was unknown outside the central states, according to Muenscher, 1944. Fernald, 1950, reports it as occurring locally from Virginia to Illinois, Kentucky, Missouri, and Kansas. D. L. Jacobs has reported it from Florida (Amer. Midl. Nat. 42: 110–111. 1949). It was very abundant in the two densely shaded cypress pools in Perquimans County where it was growing with *Wolffiella, Lemna, Spirodela, Azolla,* and *Hydrocotyle.*

ANEILEMA KEISAK Hassk. New Hanover County: south side of Smith Creek, near Wilmington, August 12, 1948, *Neil Hotchkiss* (Duke University Herbarium); Orange County: muddy inlet on University Lake, near Chapel Hill, September 23, 1950, *Radford 5479;* Vance County: small lake on Ruin Creek, near U. S. Rt. 58, 5 miles west of Henderson, October 10, 1950, *Radford 5482.*

Fernald, 1950, records this introduction from eastern Asia only from the fresh water tidal marshes and shores of southeastern Virginia. I found it flowering and fruiting abundantly in University Lake in the Piedmont on September 23.

EICHORNIA CRASSIPES (Mart.) Solms. Anson County: overgrown pool in Polkton, August 19, 1949, *Radford, 4919.*

Small (Manual of the Southeastern Flora. 1933) gives the distribution of this species from Georgia and Florida to Texas on the coastal plain. It was introduced at Polkton by a garden club member several years ago. It seems to be able to withstand the North Carolina winters. Dr. H. R. Totten, Professor of Botany at the University of North Carolina, has reported seeing water hyacinth in full flower in a large lake in the town of Bladenboro in southern Bladen County in September, 1950. Dr. D. G. Frey, Professor of Hydrobiology at the University of Indiana, has pictures of it growing in a large lake near Lumberton, North Carolina. Apparently it is becoming well established in the southeastern part of the state.

HOSTA VENTRICOSA (Salisb.) Stearn. Tyrrell County: edge of swamp near U. S. Rt. 64, 5.5 miles west of Ft. Landing, July 4, 1950, *Radford & Huneycutt 5405.*

This is the only non-aquatic vascular plant reported in the present paper. It was well established on the roadside near a swamp. Fernald, 1950, reports it as being naturalized from eastern Asia. It has become established in New Jersey, Pennsylvania, Delaware, and Maryland.

NYMPHAEA FLAVA Leitner. Johnston County: pool 2 miles east of Pine Level, near U. S. Rt. 70, June 12, 1949, *Radford & Browne 4413;* Perquimans County: Perquimans River near Hertford, July 23, 1949, *Radford 4684.*

Muenscher, 1944, gives the distribution of this species from Texas to South Carolina, most common in the Gulf States. Our collection extends its range northward from South Carolina.

Nelumbo nucifera Gaertn. Anson County: overgrown pool at Polkton, August 19, 1949, *Radford 4917;* Wake County: drained pond along roadside, 4½ miles south of Durham County line, near N. C. Rt. 55, July 9, 1949, *Radford 4547.*

This introduction from Asia seems to be well established in a small drained pond in Wake County. Apparently the dam of this pond has been out for several years, but flowing springs furnish enough water for luxuriant growth. Some of the leaves were 24 inches across. At Polkton the owner of a small fish pond tossed into the water some of the rhizomes that his wife had obtained at a garden club meeting. In less than two years he had a *Nelumbo-Eichornia* garden and no fish pond.

Elatine americana (Pursh) Arn. Jackson County: Cashiers Lake, August 2, 1949, *Radford 4755.*

My collection of this species in the cool clear mountain lake in Jackson County extends its range southward from Virginia. Fernald, 1950, reports it from New Brunswick and Quebec to eastern Virginia, also Missouri and Oklahoma. Only 15 to 20 plants were noticed at Cashiers in 1949. A thorough search of the lake the following year revealed only 4 plants.

Myriophyllum brasiliense Camb. Anson County: overgrown pool at Polkton, August 19, 1949, *Radford 4918;* Clay County: small pool 12 miles east of Hayesville, near U. S. Rt. 64, August 5, 1949, *Radford 4805;* Durham County: small pond near N. C. Rt. 264, 0.3 mile west of Wake County line, May 13, 1950, *Radford 5108;* Henderson County: drained pond 3½ miles south of East Flat Rock, August 9, 1949, *Radford 4851;* Lee County: pool near junction of U. S. Rt. 15–501 and U. S. Rt. 1, July 2, 1949, *Radford 4544;* New Hanover County: Greenfield Lake, Wilmington, June 29, 1938, *R. K. Godfrey & B. W. Wells 4817* (N. C. State College Herb. and U. S. Nat. Herb.); Orange County: University Lake, near Chapel Hill, March 30, 1947, *E. E. Hueske;* Pitt County: sandy ditch near N. C. Rt. 33, 3 miles east of Pactolus, July 22, 1949, *Radford 4569;* Richmond County: Falling Creek at Rockingham, June 19, 1949, *Radford 4505;* Wake County: Boone's Pond, north of Raleigh, June 2, 1948, *L. A. Whitford* (N. C. State College Herb.)

This is an introduced species from South America with scattered distribution in the United States. It was first collected in North Carolina by R. K. Godfrey and B. W. Wells near Wilmington in 1938. During the past ten years it has spread rapidly over the coastal plain and piedmont sections of North Carolina, much more so than the collection data would indicate. I have one collection from the mountains, but so far I have not found it

widespread in that section. Since the end of World War II thousands of fish ponds have been built in this state. Parrot's feather has spread with the ponds. Many farmers have planted it in their ponds, only to regret it later. In several localities they have had to drain the ponds and bulldoze or drag out the interwoven mass of stems and roots.

Myriophyllum humile (Raf.) Morong. Brunswick County: small pond 5 miles south of Orton Plantation, May 21, 1949, *Radford 4304A*.

My collection extends the range of this species southward from Maryland. Fernald, 1950, reports it from Nova Scotia south to Pennsylvania and eastern Maryland. This species is very abundant in many of the "Carolina Bay" pools west of the Cape Fear River between Wilmington and Southport.

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SETARIA LUTESCENS AN UNTENABLE NAME

John R. Reeder

In 1914 Stuntz (in U. S. Bur. Pl. Ind. Inv. Seeds & Pl. Imp. 31: 83) published the combination *Chaetochloa lutescens* as the valid name for the common yellow foxtail which had long been known as *Setaria glauca* (L.) Beauv. (based on *Panicum glaucum* L., Sp. Pl. 56. 1753). In the above article, Stuntz contended that the binomial *Panicum glaucum* L. should be applied to the pearl millet which had been called *Pennisetum americanum* (L.) K. Schum., and he took up the name *Pennisetum glaucum* (L.) R. Br. for this species. Thus the oldest available name for the yellow foxtail, he concluded, was *Panicum lutescens* Weigel (Obs. Bot. 20. 1772). In 1916 F. T. Hubbard (in Rhodora 18: 232) transferred this name to *Setaria* to conform with the International Rules.

There was considerable discussion in the literature some years ago regarding the correct name for the yellow foxtail. Mrs. Agnes Chase (in Amer. Jour. Bot. 8: 41–49. 1921) discussed the problem in detail and concluded that the name *Panicum glaucum* L. applied to pearl millet and not to yellow foxtail.[1] Dr. Otto Stapf (in Kew Bull. 1928: 147–149. 1928) also reviewed the

[1] See also Hitchcock, A. S. in Contr. U. S. Nat. Herb. 22: 165. 1920.

problem and came to quite the opposite conclusion. Weatherby, Knowlton, & Bean in an article in Rhodora (31: 108–110. 1929) concur with the opinion of Stapf.

One has but to look into the floristic works published in this country in the past 30 years to see that the specific epithet *lutescens* has been generally adopted for the yellow foxtail. This has been due, in large measure, to the fact that workers at the United States National Herbarium have consistently used this name. The combination *Panicum lutescens*, however, has no standing under our present Rules. Actually, in describing the differences between two species of grasses which grew in the fields about Stralsund, Weigel merely remarks that he should have called one *lutescens* ("lutescens nominaverim"), while the other might answer to the name of *virescens*. Nowhere does he directly make the combination *Panicum lutescens*, although as pointed out by Weatherby *et al.*, in most cases he uses *Panicum* or *P.* before the specific name when citing the Linnaean species. At the International Botanical Congress held in Stockholm in 1950, the following new paragraph was added to Article 37: "A binomial or other combination is not validly published unless the author definitely indicates that the epithets are to be used in a certain combination." This seems clearly to exclude Weigel's mention of "lutescens," since he did not use it in combination with a generic name.

Since the binomial *Setaria lutescens* (Weigel) F. T. Hubb. is untenable, what then is the correct name for the yellow foxtail? If we review *Panicum glaucum* L. again, there seems to be no reason why this name should be excluded. It is of some significance, I think, that the late M. L. Fernald, a careful student of nomenclature, has used *Setaria glauca* (L.) Beauv. for this plant in the new (1950) edition of Gray's Manual. Among others the noted German agrostologist Dr. R. Pilger also uses it (in Bot. Jahrb. 74: 256. 1948). Since the majority of botanists in America, however, have followed the Washington group in the use of the untenable *Setaria lutescens*, it seems worthwhile to review the case for and against the use of *Panicum glaucum* for the yellow foxtail.

Both Mrs. Chase and Dr. Stapf have, in their papers, included a reproduction of Linnaeus' treatment of *Panicum glaucum* as it

appears in Sp. Pl. p. 56. I present it once more here as it greatly facilitates discussion of the case to have this information before us.

Panicum spica tereti, involucellis bifloris fasciculato-pilosis. *Fl. zeyl.* 44.
Gramen alopecuroides maderaspatanum, spica quasi geniculata molli. *Pluk. alm.* 177. t. 190. f. 6.
β Gramen paniceum s. Panicum sylvestre, simplici spica. *Scheuch. gram.* 46.
γ Panicum spica simplici, aristis aggregatis flosculo subjectis. *Gron. virg.* 134.
Panicum indicum altissimum, spicis simplicibus mollibus in foliorum alis, pediculis longissimis insidentibus. *Tournef. inst.* 515.
Habitat in Indiis.
Setae in spica longitudine flosculorum. Foliorum vaginae oris pilosae. Dum spica recens prodiit. Flosculi in series dispositi observantur.

As can be seen from the above, Linnaeus included under *Panicum glaucum* five name-phrases with references to their authors, an indication of the distribution of the grass, and a short description. There seems to be no disagreement among students of grasses that these phrases refer to different species. The first is clearly pearl millet, the second *Elytrophorus articulatus,* the third *Setaria viridis,* the fourth yellow foxtail, and the last is doubtful.

Dr. Stapf says that the Hermann plants of the Flora Zeylanica were probably returned to their owner and were not at Linnaeus' hand when preparing the Species Plantarum and hence Hermann's plants cannot be taken as types without further evidence. Such evidence is lacking in the case of *Panicum glaucum,* according to Stapf. On the other hand, Mrs. Chase holds that the name *glaucum* itself applies to the bluish head of pearl millet and not to the yellow head of the foxtail. Furthermore the description ("Bristles the length of the flowers," and "in the young spike the flowers are seen to be disposed in series") supplies the evidence that Linnaeus had a plant of pearl millet at hand. To these conflicting opinions, I should like to add that it does not take much imagination to see the spikelets on the spike of the foxtail arranged in rows. Also, there is something glaucous about a plant of yellow foxtail. In fact Mrs. Chase's colleague, the late A. S. Hitchcock (in Contr. U. S. Nat. Herb. 22: 166. 1920) states in a description of *Chaetochloa lutescens* that the leaves are often glaucous.

It seems to me that at this late date it would be difficult to prove what plant (or plants) Linnaeus had in his hand when he

wrote up *Panicum glaucum* for the Species Plantarum. We are all agreed that he included a mixture of 4 or 5 different species. What we should be interested in is what plant Linnaeus had *in mind* when he used the binomial. Fortunately, we have that information. Apparently Linnaeus soon became aware of the incongruity of *Panicum glaucum* in Sp. Pl. ed. 1, for in the tenth edition of his Systema Naturae (1758) he confined his *Panicum glaucum* to γ of the Species Plantarum, that is the *Panicum glaucum* or *Setaria glauca* of subsequent authors. In taking this action he was fulfilling the obligation of an author, who breaks up an heterogeneous group, of indicating to which part the original name should adhere in the future. Stapf states that Gronovius' plant (the basis for γ under *Panicum glaucum* in the Species Plantarum) is in the Linnean Herbarium labeled *P. glaucum* in Linnaeus' hand and is numbered 2, the number of the species in the first edition of the Species Plantarum. To quote Stapf: "There was now no longer any ambiguity as to what Linnaeus meant by his *Panicum glaucum* and the specimen in his herbarium which corresponded to the revised conception became its 'type'."

I wish to thank Dr. A. W. Evans for his helpful criticism of the manuscript.

Osborn Botanical Laboratory, Yale University

A NEW FORM OF RUBUS ALLEGHENIENSIS[1]

Leonard P. Wolfe, Jr. and Albion R. Hodgdon

Rubus allegheniensis Porter, forma **rubrobaccus,** forma nov. Suffrutex, *R. allegheniensi* similis, sed fructibus longioribus cylindricis subrubrobrunneis, dulcissimis (vix acerbis), cannis subflavo-viridibus differt.

One indeed should be brave to describe anything new in Rubus, particularly in the Blackberries. However, the authors feel that any genetically distinct entity, with very conspicuous features, and particularly with some attractiveness to the agriculturalist, should receive some recognition from the taxonomist.

This plant, although with many fundamental similarities to *Rubus allegheniensis*, differs strikingly from it in several ways.

[1] New Hampshire Agricultural Experiment Station Scientific Contribution 133.

The color of the stems which at first is noticeably lighter green in the primocanes changes later to a distinctive yellowish-brown in the fruiting canes. The canes also are taller than those of typical material in the general area. The most striking characteristics, however, are associated with the fruits. Their color on the Ridgway color scale[2] is designated as Brazil-red which fundamentally seems to be a mixture of red and brown. The fruits, moreover, are elongate-cylindric, exceeding in length those of the typical *R. allegheniensis* in this area, but appearing to be no broader. These characteristics combined with a remarkably sweet flavor devoid of much acid quality make this a very disstinctive form which might conceivably interest those readers who are interested in cultivating Rubus.

L. H. Bailey[3] in 1890 described the variety *albinus* of *R. allegheniensis* which, by some, might be thought to include the material under consideration. Fernald[4] has reduced this variety to a form. This entity was characterized originally by Bailey among other things as being lower than the type and as having "—fruit small, creamy white, or amber-colored—" characteristics which do not apply to our plant.

The original collection was made on August 3, 1949, at the East Foss Farm, Durham, New Hampshire, about one mile south of the University campus. A colony of probably 100 or more canes occurred in an area of about 2000 square feet entirely bordered by typical *Rubus allegheniensis.* The specimens Wolfe-Latimer No. 87 collected at that time which are to be considered as the para-types are in the Herbarium of the University of New Hampshire. Later, on August 16, 1949, further specimens were taken. This collection Wolfe-Hodgdon No. 88 is selected as the type because both primocanes and fruiting canes are represented. This specimen is also in the University of New Hampshire Herbarium.

[2] Ridgway, R., Color Standards and Color Nomenclature, Wash., D. C. (1912).
[3] Bailey, L. H., Amer. Gard. xi: 720 (1890).
[4] Fernald, M. L., Rhodora x: 50 (1908).

The authors wish to thank Dr. Robert Foster, of the staff of the Gray Herbarium, for his assistance in the preparation of the latin diagnosis.

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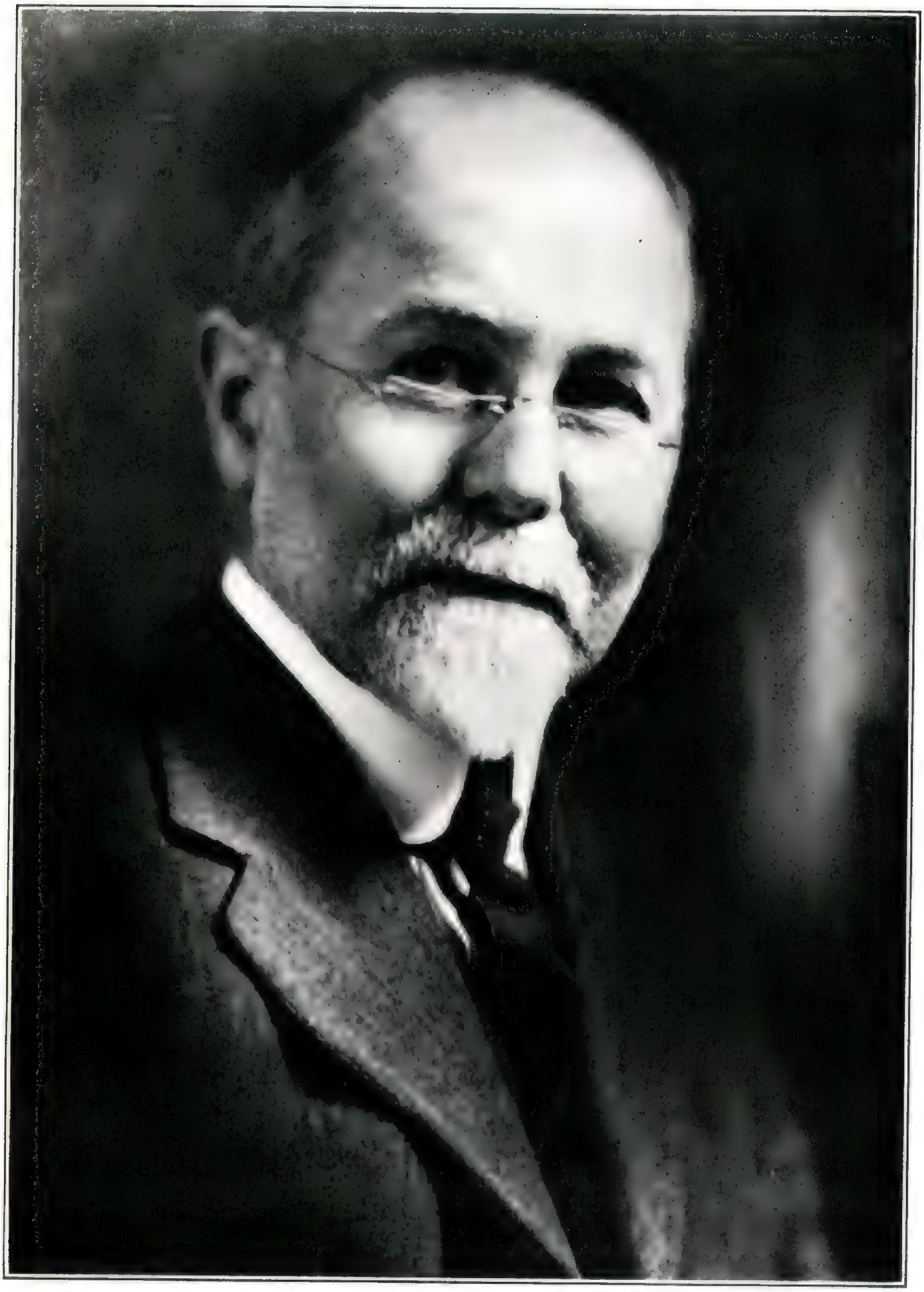

MERRITT LYNDON FERNALD

Rhodora

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MERRITT LYNDON FERNALD 1873–1950

ARTHUR STANLEY PEASE

MERRITT LYNDON FERNALD was born October 5, 1873, at Orono, Maine, where his father, Dr. Merritt Caldwell Fernald—later to become the first and third president of the Maine State College of Agriculture and Mechanic Arts (now the University of Maine)—was head of the Department of Mathematics and Physics. His mother was Mary Lovejoy (Heywood) Fernald, and he had three brothers and one sister.

After a boyhood of hard work, tending the garden and the furnace, shingling the roof, and walking a mile and a half to school, he graduated from the Orono High School, and entered in 1890 as a freshman at the State College. Soon after this appeared what seems to be the first of his long series of botanical publications, a modest little note on two *Carices* (*C. deflexa*, var. *Deanei*, and *C. chordorhiza*) in the *Bulletin of the Torrey Botanical Club*, xvii (1890), 261, followed in xviii (1891), 120–124, by a list of *Plants of special interest collected at Orono, Maine*. In this he states that he had collected there from May to August, 1890, and mentions other collections in 1889, e. g., at Cape Elizabeth, Me. Certain other plants are cited as having grown in particular localities "ever since I can remember." He names in this list nearly seventy species, many new to the state, and says that about 81 species of *Carex* are found in Maine. (Not so bad for a boy of seventeen!)

Perhaps as a result of these articles and also because of a letter[1]

[1] The correspondence mentioned between the two Fernalds and Sereno Watson is preserved at the Gray Herbarium.

which he wrote to Sereno Watson on January 30, 1891 (misdated 1890) about a *Juncus* (*J. bufonius*) which he thought was not adequately described in *Gray's Manual*, Watson, then Curator of the Gray Herbarium, wrote to him on February 4, 1891: "I have been much pleased with the intelligent interest that you have shown in the plants of your region. I have no idea what your plans or expectations for the future may be, nor even of your age or how far advanced you may be in your education. But at a venture I would say that if a career as a botanist has attractions for you there is an opportunity open here for a young man who is willing to begin at the bottom and work his way upward . . . Opportunity will be given for study and advancement and compensation sufficient at least for support. If such a position has any attraction for you I shall be glad to hear from [you] in reply." On February 7, President Fernald, who apparently had had some acquaintance with Watson "at Miss Parker's," expressed his surprise at the offer, since the boy was but seventeen. He had graduated, his father wrote, from the Orono High School, with two years of Latin and one of French, and "before entering this college he was allowed one year which he devoted quite largely to Botany in the field." His father wished the boy to have a well-rounded education, and with this wish Watson's reply agreed, emphasizing the importance of a reading knowledge of Latin, French, German, and some Greek, and suggesting that young Fernald might carry two academic courses a year and work half time in the herbarium, especially in distributing new accessions. On February 7, young Merritt wrote to Watson that the position outlined certainly did attract him, for "I think the one thing I was made for was a botanist, as from early childhood my inclinations have been in that line." Accordingly on March 6, 1891, President Fernald brought his boy down to Cambridge, and ensconced him as an assistant at the Gray Herbarium, his connection with which was destined to continue unbroken for nearly sixty busy years.

In April, 1892, Fernald completed the second edition of the *Portland Catalogue of Maine Plants*, a bare list with a brief preface over his own name. In two supplements (1895 and 1897) he showed more developed critical judgment and furnished more exact citation of his own and others' collections. Meantime, in

the autumn of 1891, he had entered the Lawrence Scientific School, in which he spent the period from 1891 to 1897, when he graduated as S. B. *magna cum laude*. (His later close associate, C. A. Weatherby, became a Bachelor of Arts the same year.)

In a class report Fernald describes himself a a "mere grind," held back by shyness from social activities, and hence not a "club-man," save for membership in the Maine Club, the Harvard Society of Natural History (where the writer first met him in 1898), and the Harvard Folklore Society. On September 16, 1891, moreover, President Fernald, in writing Sereno Watson, speaks of his son's diffidence, but thinks that it will "wear away as he comes to feel more and more at home."

His academic progress was gradual, as assistant from 1891–1902, instructor from 1902–1905, assistant professor of botany from 1905–1915, and, from 1915–1947, Fisher Professor of Natural History (the chair once occupied by Asa Gray and George L. Goodale), becoming in 1947 Fisher Professor Emeritus. In addition, from 1935–1937 he was Curator, and from 1937–1947 Director of the Gray Herbarium. With W. L. W. Field, Ralph Hoffman, and Hollis Webster, he helped to establish the Alstead (N. H.) School of Natural History, teaching in it during the summers from 1899 to 1901. In 1899 he became associate editor of Rhodora, and in 1928, succeeding B. L. Robinson, its editor-in-chief, and under his vigorous management the scope and the bulk of the journal was strikingly increased.

Young Fernald came to Harvard with a natural bent toward botanical study which he had followed since childhood, and when fifty years out of college he reaffirmed his belief that natural scientists are born, not made "in the laboratory, the place which usually deadens such interest." Though as he matured in experience and broadened in his outlook he came to respect and emphasize more and more the historical aspects of systematic botany, yet he often expressed rather scornful feelings toward those "closet botanists," who, through physical weakness or mere indolence, had no ambition to familiarize themselves with plants in their natural setting in the field. "Botanists who don't know plants," he liked to call such.

His own professional aims Fernald well expressed in his class report for 1922: "I am attempting to attain and record as exact

an understanding as possible of the natural flora of this region [Hudson Strait to Long Island and the Great Lakes] and the geological and geographic conditions of the past under which the plants (and with them the animals) have reached their present habitats; and, consequently, I am repeatedly forced to explain to the man in the street, my failure to enter a money-making profession . . . I belong to that almost extinct species, the old-fashioned systematic botanist." This phytogeographic interest largely shaped the course of his field activities. Starting at Orono, expanding to such parts of Maine as he could reach before the days of automobiles, including especially Mt. Bigelow (August, 1896, with J. F. Collins and Professor W. C. Strong of Bates College), Mt. Katahdin, and the Saint John and Aroostook valleys, he expanded his scope to include the areas about the Gulf of St. Lawrence—Bic, Gaspé, Newfoundland, southern Labrador, and the Magdalen Islands—and Nova Scotia. Many were the new species and noteworthy extensions of range detected on these expeditions, but of even greater significance seemed the theories of plant-distribution arising as generalizations from them, whether concerned with the extension of coastal-plain plants from New Jersey to Cape Cod, south-western Nova Scotia, and the Avalon Peninsula, or the notable persistence of supposed relic species of a preglacial period in and about unglaciated areas from the Gulf of St. Lawrence westward, or the control of plants by the chemical constituents of their soils. It is significant of this interest that, when I asked him, a few weeks before his death, to what studies he would apply himself when the new edition of *Gray's Manual* was completed, he replied that he had in prospect a large work on plant-distribution, collecting, revising, and integrating his various scattered articles on coastal, alpine, and other groups.

Fernald's summer expeditions, carefully planned and accompanied by both expert and amateur assistants, are remembered by those who were fortunate enough to participate in them as physically strenuous and sometimes excitingly adventurous, and it comes as a surprise to one who has seen him battling with the scrub on a pathless Gaspesian mountain or enduring the hardships of the northern Newfoundland coast to read in his fifty-year report that from early childhood a weak heart was always his

handicap. At Harvard the college physician had cautioned him against strenuous effort. "However," writes Fernald, "when I invited him to join me on a camping trip in Northern Maine, I spent my time exploring the mountains while he lay all day in the hammock. Shortly after that he succumbed." Later, when heart trouble prevented further mountain explorations in the northeast, he could find in tidewater Virginia enough of hard work and long hours to test any companions save the most seasoned, and enough thrilling experiences to show that the field was far from exhausted. The journals of his various trips, recorded in the pages of RHODORA, indicate that his keen discrimination, his feeling for the human interest in botanical adventure, and his ever playful sense of humor, might have produced some very readable books of travel, had he had the time to give to such writing.

Fernald's powers of observation were keen and quick, until, in his later years, cataracts obscured his vision, but, though slowing up his rate of work, did not shorten his hours of labor. With a remarkable memory for the normal characters and the habitual ranges of thousands of species, he was prompt to detect any variation, and clear and accurate in describing it. It was not enough, moreover, to describe a new plant, but it must be carefully differentiated from its nearest congeners; consequently his experience in "keying up" new species stood him in good stead in preparing the full keys in the eighth edition of *Gray's Manual.*

In 1908 he collaborated with Professor B. L. Robinson in writing the seventh edition of the *Manual;* in 1943 with Professor A. C. Kinsey he published *Edible Wild Plants of Eastern North America;* and, finally, in the summer of 1950, after an interval of forty-two years, appeared the long-expected and monumental eighth edition of the *Manual,* in large part his own work during that period. It is a cause for thankfulness that his sudden death (September 22, 1950) did not occur until after this *magnum opus* had been safely published. Beside these books he had written over seven hundred and fifty papers and memoirs, many of them of considerable length.

Though Fernald belonged to no social club (save the Harvard Faculty Club), he was connected with many professional societies the New England Botanical Club (president 1911–1914);

the American Society of Plant Taxonomists (president 1938); the Botanical Society of America (vice-president 1939, president 1942); the American Association for the Advancement of Science (vice-president 1941); the Societas Phytogeographica Suecana; the Linnaean Society (London); the Botanical Society and Exchange Club of the British Isles; and the Torrey Botanical Club. He was a fellow of the American Academy of Arts and Sciences; the American Philosophical Society; a member of the National Academy of Sciences; a corresponding member of the Academy of Natural Sciences (Philadelphia), the Société Linnéane de Lyon, and of the Norske Videnskaps Academi; a member of the International Committee on Botanical Nomenclature (1930–1935) and the Association of American Geographers, and various other organizations. He was awarded the honorary degree of D. C. L. by Acadia University (1933) and that of D. Sc. by the University of Montreal (1938); also the Leidy Gold Medal of the Academy of Natural Sciences at Philadelphia (1940), a Gold Medal from the Massachusetts Horticultural Society (1944), and the Marie-Victorin Medal, given by the Foundation Marie-Victorin for outstanding services to botany in Canada (1949).

In 1907 he married Miss Margaret Howard Grant of Providence, R. I., who, with one daughter Katherine (Mrs. H. G. Lohnes), one son, Henry Grant Fernald, and six grandchildren, survives him. A second daughter, Mary, died in 1927.

What Fernald's friends and even casual acquaintances will remember about him is not, however, his official positions and honors nor even the bulk of works which he produced, but the unforgettable personality of the man. Tireless in labor, vigorous in expression, fearless and outspoken in controversy or criticism—sometimes embarrassingly so—, he yet had a real appreciation and respect for honest work of others and the power, by suggestion and commendation, of stimulating in them—especially in students and those not too set in their own ways and conceits—an enthusiasm for research and discovery. Though he never wore his heart upon his sleeve he had a deep respect for sincere moral character, and though scientists are sometimes accused of impersonal stolidity, of all his sayings I like best to remember that once, in reply to a thoughtless youthful remark of mine that a certain investigation, even if carefully pursued, could have only

a sentimental value, he said, with a good deal of feeling, "This world would be a pretty poor place if there were no sentiment in it."

FERNALD AS A TEACHER

John M. Fogg, Jr.

It was through the medium of his writings that I first became acquainted with Merritt Lyndon Fernald. As a beginning student in Systematic Botany, I early discovered the bound set of Rhodora in our Departmental Library and, starting with Volume I, set myself the task of reading every number of this Journal and preparing my own card index of all new species, varieties and combinations, with cross references to significant range extensions, local floras and items relating to plant geography. It was in this manner that I formed a high and lasting regard for Fernald's botanical scholarship, his careful and precise use of English, and, above all, his intimate and critical knowledge of the flora of Eastern Temperate North America.

As I read his paper on "The Plants of Wineland the Good," studied his revisions of difficult taxonomic groups, devoured his discussions of glaciation, Post-Pleistocene land bridges and nunataks, and, above all, avidly consumed his accounts of field work in Nova Scotia, the Gaspé Peninsula and Newfoundland, I conceived an intense desire to meet the author and especially to have the privilege of accompanying him on a botanical expedition. The realization of both these wishes I owe to my good friend, Mr. Bayard Long, who somehow succeeded in persuading Fernald to invite a young botanist at the University of Pennsylvania to join Long and him on a brief field trip to Newfoundland late in the summer of 1926, following the Fourth International Botanical Congress at Ithaca.

It was on this expedition, the first of many, that I came more fully to appreciate the dynamic qualities which made Fernald the greatest student of our eastern flora since Asa Gray. Our assignment on four short weeks in the field was divided between exploring the country around Lark Harbor on the west coast of Newfoundland and collecting on the granitic barrens of the south coast near Burgeo. Those favored students who have been with

Fernald in the field need not be reminded of his indefatigable energy, his keenness of perception, and his uncanny ability for recognizing significant variations. To me, one of the most delightful features of this experience was what came to be known as "the bed-time story." After the day's collections were safely in press, and often by the flickering light of an oil lamp, it was our invariable custom to gather around while Professor Fernald, with the aid of his homemade check list, ran through and entered the finds of the day, with a running comment on the distributional vagaries of the plants concerned and illuminating observations on botanists past and present. In these informal sessions a multitude of new species and varieties was conceived, some of them to be born later in the pages of Rhodora, others falling by the wayside as their characters were subsequently shown to be too trivial for recognition. It was in this manner that I first realized the full stature of Fernald as a preceptor. His seemingly inexhaustible supply of information concerning taxonomic literature, his remarkably tenacious memory, his capacity for seeing the forest as well as the trees, all combined to make of him a superbly interesting and stimulating teacher.

It was on this expedition that I first took up with Professor Fernald the matter of my coming to the Gray Herbarium to pursue my doctoral dissertation under his supervision. His advice, for which I am everlastingly grateful and which I consider valid for all graduate students, was that instead of accepting an assistantship or a teaching fellowship, I should arrive unencumbered by any obligation other than to devote myself full time to my problem. When, therefore, I presented myself at the Gray Herbarium in the autumn of 1927, I had completed my formal program of graduate course work and was, for a year at least, financially independent. I was thus divorced from the necessity of taking courses, although, at Fernald's suggestion, I "listened in" on his undergraduate course in Systematic Botany, as well as his famous Botany 10 (Classification and Distribution of Flowering Plants; Advanced Studies on Special Topics). The first of these provided an interesting revelation of Fernald's classroom technique. Following a key to seed plants which he had constructed, and which with some modifications has found its way into the Eighth Edition of Gray's Manual, Fernald took

up in his lectures the families of Spermatophytes, beginning with the Pinaceae. After elucidating familial and generic characters, our lecturer proceeded to discourse upon the more significant species, pointing out their distinguishing traits and presenting a wealth of information concerning their geographic distribution and economic importance. When, by the end of the first semester he had not even reached the end of the Monocotyledons, it became a question in the minds of the members of the class as to whether the course was going to take two or three years for completion instead of the single academic year as announced. Nevertheless, our Professor, without seeming to curtail the vast amount of interesting material at his command, somehow managed to quicken his pace, so that by the final lecture in May, the Composites were safely tucked in. We had learned how to cook young cattail inflorescences, how to prepare biscuits from flour made from the corms of *Arisaema triphyllum*, and how to be assured of a steady supply of "winter asparagus" from the roots of *Phytolacca americana*. Also, those of us who had taken careful notes were in possession of a fine new natural key to seed plants to try out on our own students.

Botany 10 was a flower of another color. Our small class, which included G. Ledyard Stebbins Jr., H. K. Svenson and Father Louis Lalonde, spent much of its time following Professor Fernald around the Herbarium as he opened case after case and listening to his informal but illuminating discussion of such genera as *Sparganium*, *Potamogeton*, *Poa*, *Carex*, *Scirpus*, and many others. These demonstrations provided Fernald with an opportunity for pointing out diagnostic characters and emphasizing the criteria which he employed in his monographic and revisionary studies. In this manner the student learned how to tackle a difficult taxonomic group as well as how to use the literature. Always, however, there was the healthy insistence, so well exemplified by Fernald's own procedures, that herbarium work must be supplemented by study in the field.

On of the most delightful episodes of Botany 10 occurred during a three or four week period when the class sat with Fernald around a table in the Library and watched him leaf through the Gray Herbarium's priceless collection of autographs and por-

traits[1] of botanists. Ascherson, Engler, Grisebach, Sir Hans Sloane, the Bauhins, Engelmann, Boott, Steudel, Pringle, the Hookers, Tuckerman, Solander, Willdenow, Rafinesque, Torrey —these and a host of others passed before us in review as Fernald commented on their lives, their travels, and their more important contributions to botanical literature.

In the latter part of the course—and here, it seems to me, he was at his best—Fernald discoursed on his own explorations and expounded his views on such significant and often controversial matters as the persistence of plants in glaciated areas, the effects of coastal subsidence on the distribution of plants, the origin of the Coastal Plain flora, and the high degree of endemism around the Gulf of St. Lawrence. These discussions, in which the members of the class were invited to participate, were highly stimulating and furnished a striking example of the sweep of Fernald's mind coupled with his mastery of detail.

The prosecution of my own piece of work brought me into almost daily contact with Professor Fernald, to whom I never appealed in vain for assistance or advice. My primary task of determining many hundreds of specimens collected on the Elizabeth Islands gave rise to a multitude of questions, especially in dealing with critical genera, and although Fernald seldom revealed his judgment as to the identity of this or that specimen, he invariably directed me to sources which, if properly utilized, yielded the correct answer. This I conceive to be a distinguishing characteristic of a truly fine teacher.

Anyone who has ever worked in the Gray Herbarium will recall Professor Fernald's custom of reading aloud to all and sundry any manuscript on which he happened at the moment to be working. During much of the time that I was in residence there, Fernald was preparing his great paper on the linear-leaved species of *Potamogeton.* Stebbins and I occupied adjoining tables in the New England Botanical Club Wing, and as Fernald in his reso-

[1] This collection of autographs of botanists, botanical collectors and patrons of botany, was started by Asa Gray during his first visit to Europe in 1839, Mrs. Gray adding to it extensively during Gray's life and after his death. A supplemental collection was given to the Gray Herbarium in 1890 by Isabella B. James. The latter contained autographs of a remarkable number of early American botanists. The entire collection, including not only autographs, but biographical notes, letters and often portraits, was arranged and mounted in five large volumes under Mrs. Gray's supervision. These she presented to the Gray Herbarium in 1898.—R. C. R.

nant tones read portions of his manuscript to each new visitor, we came to know sections of this work almost by heart. Indeed, so familiar were we with the text that when Fernald was interrupted or halted for breath, Stebbins and I would continue to intone, verbatim, the ensuing sentences and paragraphs. This willingness to share with others the results of his labors is one of the attributes which made M. L. Fernald such a stimulating companion in the classroom and in the field. It was my further privilege almost daily to accompany him and, during his all too rare visits at that time to the Herbarium, Mr. C. A. Weatherby, to lunch, at which time systematic botany was the sole topic of conversation, with Fernald leading the discussion. Few botanists known to me have been characterized by such singleness of purpose and whole-hearted devotion to their subject.

It is not my function to speak further of Fernald as a companion in the field, but I cannot refrain from stating that subsequent explorations with him in Newfoundland, southeastern New England and the coastal plain of Virginia served only to confirm and strengthen the impressions gained on my first trip in 1926 and combined to provide a rich and rewarding background of experience, which, in a spirit of everlasting indebtedness, I am happy to acknowledge.

In 1865, William James accompanied the great Louis Agassiz on an expedition to the Amazon. In writing to his father about the leader of the party, James said, "No one sees farther into a generalization than his own knowledge of details extends, and you have a greater feeling of weight and solidity about the movement of Agassiz's mind, owing to the continual presence of this great background of special facts, than about the mind of any other man I know . . . I see that in all his talks with me he is pitching into my loose and superficial way of thinking." It is the opinion of at least one of his students that this estimate might with equal validity be applied to Fernald. Intolerant of slip-shod methods, acidulously critical of all that he considered mediocre, yet ever ready to praise the results of painstaking and conscientious work, M. L. Fernald's influence as a teacher extended far beyond the confines of the classroom and did much to raise the standard of descriptive systematic botany in this country.

FERNALD AS A REVISER OF GRAY'S MANUAL

Harley Harris Bartlett

Before entering college I wrote to Professor Fernald from Indianapolis asking if a Freshman who was already keenly interested in botany would be allowed to take his course "Botany 7: The Flora of New England and the Maritime Provinces of Canada." The answer was "Yes," for those were the good old days of President Eliot and free election, when any student could enroll in any course if he could persuade the professor to admit him. There never was an educational policy better adapted to professors and students who liked to do as they pleased! After poring over all the college catalogues available, I had decided that nowhere else was there a course like Harvard's "Botany 7." How amazingly true this proved to be I soon discovered, for Fernald was as extreme an individualist in teaching as he was in his scientific work. He worked in such flares of enthusiasm that whatever engaged him at a particular moment was for the time being the most important thing in the world to him, and so it had to be to his students. There were only two of us that year (1904–1905) and we were guinea pigs on whom his ideas were tested out. As for background, he seemed to assume that if we didn't already know the minute distinctions among all the species he talked about with such glowing enthusiasm we soon would, and since he referred to *Carex* so frequently, his monograph "The Carices of the Section Hyparrhenae" was soon fixed upon as an exemplar for method and systematic concepts. These particular sedges, it would seem, must illustrate all truly important botanical phenomena and types of geographical distribution in North Eastern America, and it would be a long time before any other region need concern us! Fernald took me to an old wooden case where the reserve numbers of the "Contributions from the Gray Herbarium" were kept, got out a copy of *the most important one,* that on the *Hyparrhenae,* inscribed it to me, told me that he had also written a big one on the genus *Salvia* in Mexico, but that it was really far inferior, because he had never seen the plants in the field, and, anyway I shouldn't be concerned with Mexico. A firm teacher-student friendship was at once established between Fernald and myself, for he became

and remained my favorite professor. He was inclined to think well of people from Maine, other things being equal, and since both his mother and my father had been born in Bethel, Maine, I was only a generation removed, which made a certain bond that nobody but a down-East Yankee might recognize!

Many who did not know Fernald well too hastily concluded that his predominant traits were vanity and acrimoniousness. This was very far from the truth. He was easily moved to intemperate expression of emotions which others with more control might conceal, but he was essentially friendly and helpful. His vast excitement over what sometimes seemed of small significance was what kept him so amazingly active and productive. In the days when I knew him best he was never assailed by doubts about the value of what he was then doing, but he was very critical of those who were doing something that he would not spend his own time doing. I remember that one time he remarked on what a disappointment Thiselton-Dyer's career had been, as Director of Kew. He said that Thiselton-Dyer had had as great a chance for a productive career as Joseph Dalton Hooker, but had frittered away his time, although his obvious duty to botany was not to waste a moment of an opportunity denied to most botanists, when he was the one, chosen from among hundreds, who had a chance to do great things. At this outburst Dr. Robinson, who was the essence of kindliness and moderation, and seldom allowed himself to pass a snap judgement, was genuinely shocked, and made what was, for him, a vigorous rebuttal. The clash of personality between the two men was so great that they never seemed sufficiently compatible to work together harmoniously, and actually their co-operation in the revision of Gray's Manual for the seventh edition was negligible, consisting merely in each doing part of the work. There was no community of concepts.

Their social life was utterly different. Robinson would typically invite his friends to meet some distinguished musician at his home and meticulously observed all the social amenities. Fernald would propose an all-day Sunday tramp in midwinter, starting from some point reached by rail. Then, as he said, the swamps and bogs were all frozen over and you could see just what they were like. After tramping all day in the cold with

nothing to eat except maybe frozen cranberries from a bog, boiled in melted snow in an old tomato can salvaged from a roadside dump, he would take his guest home to a midnight repast of lamb chops only, broiled on forks over the coals in the furnace down cellar, and eaten out of hand, squatting on the floor in front of the open furnace door. On such an occasion Fernald was at his best, jolly, full of zest and good-fellowship, and infectiously enthusiastic about life in general and the New England flora in particular.

After I got acquainted at the Herbarium, it was not long before great piles of pasted-up manuscript made their appearance for the forthcoming (7th) edition of Gray's Manual, which was not actually published until 1908 but had already been long in preparation. The basic copy had been prepared by pasting clippings from the older edition, family by family, onto sheets and arranging them in the Engler and Prantl sequence. Changes had been made in almost every line at various times, so that the revised copy resembled especially foul corrected proof. Some parts were Robinson's especial responsibility and were mostly revised by him, and others were Fernald's, but either of them fixed whatever errors or omissions came to his attention.

Robinson was the more systematic worker, for he was inclined to work straight along, in the quiet of the old Gray study, dealing with the pages as they came. Not so, Fernald. He would get started on some particular species or group by finding something of interest in the course of current routine determinative work. It would lead him into a hectic investigation that sometimes fell flat but generally resulted in a big or little article for Rhodora, and the random articles provided the basis for revision of the Manual copy. So practically everything he did after about 1901 was directly contributory to the Manual, but some groups received minimal attention. He needed the stimulus of some discovery to set him off. It did not have to be a large one. Sometimes, in fact, the supposed discovery petered out, but it would have resulted in some critical determinations that helped the good cause along. So there was continual progress with the Manual but it never seemed to get done.

Even "Botany 7" had to do some small part. Our laboratory work consisted largely in trying to prepare tentative keys to

genera that had been skipped, or in testing out revised keys with current herbarium accessions, or in testing the applicability of work published after the "Manual" copy had been prepared, which might necessitate still further changes. To what extent in later years "Botany 7" continued to be a device for preliminary testing of the "Manual" revision I do not know, but Fernald was not one who readily changed his ways and it is to be presumed that the preparation of the eighth edition followed much the same course as that of the seventh.

In Fernald's early years as a staff member there were four chief continuing institutional projects at the Gray Herbarium. In addition to (1) the revision of Gray's Manual, these were (2) the continuation of the Synoptical Flora of North America, (3) the study, in accordance with an agreement of co-operation with the National Herbarium, of the numerous new collections that came to hand yearly from Mexico and Central America, and (4) the indexing of newly described systematic entities of the Western Hemisphere.

As already indicated the first of these was originally shared by Robinson and Fernald, but fell eventually to the latter; the second was Dr. Robinson's; the third was divided among Robinson, Greenman and Fernald; and the fourth had come to be exclusively Miss Day's.

Fernald's inheritance of the Manual revision came about gradually. Participation in the study of the Mexican and other tropical collections became increasingly distasteful to him, for he could not keep up an interest in floras unless he personally knew many of the species in the field, when he had not actually worked in the regions. Any species that grew in northeastern America interested him wherever it occurred, or was supposed to occur, and he would therefore spend much time studying Scandinavian specimens and publications. A region whose flora was largely dissimilar to that of the Northeast had no attraction for him.

To accord with his interest in the plants of eastern Canada the limits of the Manual region were extended northward, and for a good many seasons he worked with a succession of botanical comrades in Quebec and Newfoundland. At length, having stimulated the interest of Canadians in taking over the study of the northern border, and wishing to do his own field work where

there were the best chances for significant discoveries, he turned to the coastal plain of Virginia, where he made a multitude of interesting additions to the flora of the "Manual region." At the close of each field season he returned to the Herbarium with keenly whetted enthusiasm for studying the new collections, and the idea of doing anything unrelated to that seemed almost intolerable to him.

It was part of the routine of the Herbarium to identify the tropical collections as such. Then, at length, after isolated species had been described in a genus, and sufficient material seemed to have been accumulated, an effort would be made by a staff member or student to prepare a comprehensive revision. The annual collections of Pringle and Palmer were the chief dependence for progress in the somewhat vaguely defined tropical American project, but there came to be more and more field workers, such as Millspaugh and Gaumer, in Yucatan, C. C. Deam, in Mexico and Guatemala, Peck in British Honduras, John Donnell-Smith and his associates in Central America, Rose and associates, mostly in Mexico, Lumholtz in Mexico, and not a few others. The effort to make some current systematic disposal of all this material often required that species be described not by systematic revision of a mass of material but from single specimens, the distinctions of which might or might not hold up in the light of subsequent collecting.

This work on miscellaneous tropical plants engaged much of Fernald's attention until about 1901 when he practically declared his independence of it. This restriction and unification of his interests were clearly in the best interests of the Gray Herbarium. The New England Botanical Club contained many of the best friends of the Herbarium, who did whatever they could, financially and otherwise, to support it. Financial support was never sufficient and although the Gray Herbarium was one of the most eminent and deserving of Harvard departments, it led a somewhat hand-to-mouth existence and had to beg of its friends in order to carry on any kind of a worthy program. So it was essential not to fail to serve the local constituency of those who were primarily concerned with the local flora. In botany Harvard's policy was then, as it still remains, to belittle its own best achievements and to disregard its most valuable resources

and traditions in building for a glorious new future. So the Herbarium, then and subsequently, had the problem of finding in large part its own sustenance, with little aid or encouragement from the top echelon.

In providing for successive editions of Gray's Manual, Harvard, however grudgingly, has performed an important national educational and scientific service. Fernald was an inspiring leader of local flora investigators and during four decades botanists looked forward to the appearance of the new "Gray" as an event of genuine importance, as it was. One of Fernald's botanical colleagues of many years standing, Professor Bradley Moore Davis, has well expressed what many of us feel about Fernald's constant devotion for over forty-five years to revision of the Manual. He wrote in a recent letter: "Fernald's death brought to close a well ordered life that followed a consistent pattern, to the end that he accomplished much."

In its early years the New England Botanical Club was an enthusiastic organization, largely of amateur systematists and of professional botanists whose interest was not chiefly systematic, but whose attention to various local floras or incidental collecting turned up many problems that could best be referred to the staff of the Herbarium.

Fernald was ready and willing to act as a central consultant for this large group of botanists, which soon extended far beyond the membership of the club. By the time the eighth edition of the Manual was completed, he had had cooperation to some degree from about 400 collaborators, whose problems and questions all had to be reasonably answered by his investigations. Probably no botanical systematist had ever before gone so far in satisfying so many active finders of deficiencies and faults in a standard flora!

Fernald's concentration on plants of the "Manual" region began with his early work on the local flora about Orono, Maine. His first botanical correspondents, John Parlin and Kate Furbish, established the type of relationship that later extended to correspondents far and wide. His enthusiasm for regionally restricted floristic study was so boundless that it sometimes impressed others as ludicrous or boring. Published expression of it probably reached its height in an advertisement which he wrote for

the Bangor and Aroostook Railroad, published (anonymously!) in Rhodora for April 1903. Never before or since has there been such an advertisement, which should by all means be included in a bibliography of Fernald's writings. There have been many railroad and steamship blurbs directing the attention of tourists to such natural wonders as the big trees of California or the hot springs of New Zealand, but surely even the botanical traveller had never before been invited by a railroad in an advertisement of four pages of fine print to patronize its facilities in order to see such astounding treasures of Maine as the "rare Carices, *C. tenuiflora, gynocrates,* and *vaginata,* or the little sundew *Drosera linearis.*" On the upper Mattawamkeag the botanist was promised no less than "the white foam-like masses of the spicy Labrador Tea, *Ledum groenlandicum,* rich rosy banks of the Pale Laurel, *Kalmia glauca,* indefinite white waves of the Alpine Cotton-grass, *Eriophorum alpinum,* brightened here and there with the deep yellows of Cypripediums." Nor must he fail to look below the surface, for, in the Piscataquis and the Mattawamkeag, would be found *Myriophyllum Farwellii* and *Potamogeton obtusifolius!* Elsewhere the visitor would thrill at the sight of "the largest of the Rattlesnake Plantains, *Goodyera Menziezii,* the rare Arctic Fleabane, *Erigeron acris,* the remarkable local Wood Betony, *Pedicularis Furbishiae,* unknown outside the St. John Valley." Finally, if these and other delights should pall, the prospect of even greater adventure was held out, for "the botanist whose good fortune takes him to the upper St. Frances may watch with hope for *Pleurogyne carinthiaca, Eriophorum russeolum, Astragalus elegans, Parnassia palustris, Saxifraga caespitosa, Anemone parviflora, Cornus suecica, Pedicularis palustris,* and many other arctic plants known closely to approach northern Maine"! I know nothing in botanical literature with quite the flavor of this advertisement except Bartram's "Travels." It would warm the cockles of any botanical heart.

Fernald's enthusiasm was literally unbounded when he had made or thought he had made some discovery, whether in the field, or among his own collections, or those of his correspondents. The moment anything came to light that seemed to require the segregation of a new species or a revision of the accepted delimitation of some group, he would immediately start sorting the

material of the Gray Herbarium into piles. In his earlier days, at least, he seemed to have a sublime trust that all essential material would either be ready at hand in the Gray Herbarium or that a problem insoluble with its then available resources could well wait until he had personally seen to the collection of new specimens. He rarely borrowed from other herbaria except

Fernald at work in the Gray Herbarium.

for the utilization of what might be at hand in the collections of the New England Botanical Club. As for the Herbarium of the Arnold Arboretum, it might as well have been in Timbuctoo as in Jamaica Plain, so far as any utilization of it during my five years in Cambridge was concerned. During that period, I believe I am correct in stating that Fernald did not once visit the Arnold Arboretum, nor did his colleague Robinson more than once, and then not with a botanical objective.

Like many older herbaria, the Gray Herbarium in the pre-Fernaldian era had been developed to conserve space and costly paper by gluing specimens supposedly of the same species to the same sheet, quite regardless of geographic origin. This exasperated Fernald beyond measure, for it made it impossible to sort specimens into piles, first by one characteristic and then by another, or geographically, with the ceaseless industry that was Fernald's when he was intent upon a problem. So many a time

he started work on a genus by snipping all the mixed sheets to pieces, which he strewed in apparent unconcern all over the big central table in the main herbarium room, where he always worked. Dr. Robinson would come in, look with consternation and anguish at the wreckage, allow himself to remark gently that he wondered "how anyone could ever again interpret the concepts of the Synoptical Flora," and retreat from the painful sight into the old Gray study. (Among the Harvard botanists of the time Robinson was the chief exponent of the soft answer that turneth away wrath.) Then Miss Anderson would gather up and patiently glue all the severed fragments onto new whole sheets, but with each specimen by itself.

Fernald's technique, in those days, at least, was not to make notes and study those until he arrived at a classification of specimens that satisfied him. There was no tabulating of data. Nothing would do but interminable rearrangements of the specimens themselves. Once when Dr. Robinson mildly suggested that much deterioration could be prevented by sorting notes instead of specimens he retorted indignantly that one who had a *feeling* for the importance of *habit* would never be satisfied to handle notes instead of specimens. "Could you," he said, "see something you had quite overlooked before if you were just sorting cards?"—and the argument was unassailable. Even when sorting specimens by measurements of some organ he seldom, if ever, recorded each measurement and subjected the data to even the most rudimentary statistical analysis. Rather, he decided upon some measurement that might set the best limit between two groups, and sorted his material as "greater" or "less" than that. If the separation by a single critical measurement of a mass of material into two piles failed to correlate with other criteria of distinction he simply tried again with a new measurement.

Even though Fernald was prone to be satisfied to come to conclusions by examination of only the material that was at hand, he was indefatigable in making some disposition of every specimen that he had, down to the poorest. He was not one to pick out a single apparently distinctive specimen and describe it as a type, hoping that time would confirm his judgement. He was unsparing in caustic criticism of persons who would propose a

new species, or even a variety, without making a decision about the identity of every other related specimen at hand. Whatever may be thought of Fernald's segregations, they were proposed after making a conscientious identification of every related specimen that he had, according to his own criteria. He was especially suspicious of proposed systematic entities that did not seem to have a consistent or logical geographic distribution, and having to interpret or recognize one of Greene's numerous species, based upon a single specimen, caused him extreme indignation.

He was therefore sometimes vigorous in his denunciation of his own earlier work on the Mexican species of *Salvia.* He never referred disparagingly to "species" of *Salvia* however, except when hearers had a shrewd suspicion that they would get his meaning more correctly if they mentally substituted "Eupatorium" or "Crataegus" for "Salvia."

In his talks to students Fernald was often quite intemperate in his criticism of other botanists. On one occasion when he saw written down in our notes some of the disparaging remarks he had made about botanical colleagues at various institutions he was deeply chagrined and apologized for having gone so far. As he warmed to his subject, however, he was soon very nearly back to the point of departure. Still, he had a very generous appreciation of many other botanists. He generally referred to Bicknell's work on *Sisyrinchium,* for instance, with commendation, but had a very low opinion of Burgess's work on *Aster.* It caused him a pang when he had to admit the validity of certain of Green's propositions in *Antennaria,* or Nash's and Ashe's in *Panicum.* Fernald's denunciations of other botanists and their work were not often intended to hurt, however, and after he himself had forgotten making them, were quite as likely as not to be followed by friendly and appreciative expressions.

A good example was given by his reaction to Kükenthal's work on *Carex.* At first sight he thought it magnificent. On second sight he found it full of exasperating errors, which he condemned roundly. Then he thought that what the worthy pastor needed was to spend a year in Cambridge as his guest, learning American geography and examining plenty of American material. But Kükenthal couldn't come. "Then he isn't much of a botanist

anyway, if he doesn't accept a chance to correct his errors, and would rather just let them go," raged Fernald, and condemned the whole breed of Germans in general for gross carelessness, and Kükenthal in particular. Then finally he arrived at the conclusion that Kükenthal had done a fine job after all but had made sundry little errors, that he, Fernald, might quite calmly rectify himself! One German of whom he always (that is, *nearly* always!) approved was Buchenau.

Nearly every investigation, large or small, that Fernald undertook in the interval between the two last editions of the "Manual" may be considered a preliminary study for the eighth edition of that work, but was promptly published in Rhodora. This journal afforded him an outlet for one or more articles, critical reviews and notes each month, from the very beginning, the whole representing a prodigious amount of writing. As time went on, this journal became more and more an expression of his personality and views. Sponsored by the New England Botanical Club, in which Fernald's strong personality was dominant, it early came to be one of the most highly personalized of scientific journals, in an era in which most editors have deemed it scandalous to reveal any personality at all.

In the early days of Rhodora there was an annual meeting of the Club at which the editorial board of an imaginary "Rhodorella" made a report that tingled with satire and fun. It was much in accord with Fernald's impulses to express himself with an informality and freedom that seldom appear in these stodgy and formal days. So the reviews in Rhodora were sometimes almost as spicy as they might have been in Rhodorella!

Since Fernald's prejudices were so strong and so unsuccessfully inhibited it is quite understandable that he did not keep every trace of his personality out of the "Manual." For example, he had no use for spurious common names, made by translating scientific names into English, and had the courage of his convictions in refusing to adopt them in the Manual. The sheer pedantry of "standardized common names" got no encouragement from him. He required that common names, to be admitted, must belong to common language, not merely to an artificial jargon. It is greatly to his credit that he was content to be considered reactionary in this respect. He was likewise

reactionary to a certain extent in disregarding some of the technical jargon that distinguishes newer developments in systematics. It is just as well. There is much pomposity and verbosity in science nowadays that has little if any utility. Fernald worked from the end of the period in which systematics dominated botany, through a period in which systematics seemed old-fashioned and on the wane, and into a new period in which systematics is being revitalized by the experimental investigations of geneticists, cytologists and biochemists. Methods of investigating relationships are becoming more and more critical and time-consuming. The days of dependence in distinguishing species upon intuitive perception of the integrity of an assemblage of characteristics may be thought to have passed. If, however, we consider the need for comprehensive works on large floras, the small number of botanists to do the world's vast botanical work, and the inadaptability of many plants to experimental investigation, then Fernald's life work in the honorable "Old Systematics" will be seen to have a value that the passage of time will not soon efface. In view of the application of experimental methods in an increasing number of groups, it becomes more and more apparent that the time during which one man can come to have a critical knowledge of most of the flora of a region as large as that of Gray's Manual has passed. So his book will be a lasting landmark in the botanical history of our region. It is a source of deep satisfaction to his devoted botanical following that he lived to see it in print.

As I have said elsewhere, "the new Manual is a highly satisfactory and noble achievement, the culmination of a lifetime devoted to the reinterpretation of our flora, as largely on the basis of zealous personal field work as half a century would permit."

University of Michigan
Ann Arbor

FERNALD AS A BOTANIST

Reed C. Rollins

Seldom is it possible to say in truth that a man's life was his work. But such a statement seems not an exaggeration when applied to Merritt Lyndon Fernald. Even during his last years he worked with aggressive intensity, and it seemed to those around him that he hurried as if to forestall the lengthening shadow of age that was so incessantly compressing the time left to complete the tasks he had set. His hours of labor at the herbarium daily were extended into the night at home. A mild thrombosis, which he suffered on two occasions, scarcely slowed the tempo of the writing that had flowed from his pen like a torrent for half a century. At work, he rarely stopped except to read aloud from his writings to almost anyone who chanced to be near. Scarcely a visiting botanist to the Gray Herbarium departed without having been "read to." He seemed to evolve clarity of expression from reading aloud and on each occasion would busily correct or annotate the manuscript. Perhaps the dominant influence upon his professional work were his tremendous industry and a strong devotion to taxonomic botany.

Professor Fernald's career formally began immediately after graduation from college but it might be appropriately calculated from his first publication in 1890. Possibly because of his own early interest in natural history, he was a strong believer in the dictum that "natural scientists are born, not made." His first studies were "in the field" and he was fortunate enough to maintain a satisfactory balance between field and herbarium studies throughout his entire career. His life was largely devoted to an intensive study of the higher plants of temperate eastern North America. He knew the plants of this area intimately and could relate an interesting story about nearly every species. From the point of view of his students, some of his greatest moments were undoubtedly those spent on the shores of a pond on Cape Cod, or perhaps on a mountain slope in Newfoundland, where he would give a keen analysis of the principal characteristics of a plant in hand and then proceed to recite the points of distinction from closely related species, geographic ranges, and comparative usefulness to man. Such an unrehearsed performance could be ex-

pected many times in the course of a day in the field and never failed to elicit admiration for the well-ordered mind from which it came.

By far the largest amount of Fernald's published work concerned questions of the identities, accurate definition and geographic distribution of a wide range of vascular plants. He placed chief emphasis upon that aspect of taxonomic botany sometimes called floristics. Early in this work he discovered that the older botanists had not been too careful about checking and properly correlating the names in use with the specimens upon which they were originally based. The type concept had not been accepted then and they considered this unimportant. Since the plants of eastern North America had largely been distinguished and described by European botanists, Fernald often turned to the classical specimens preserved in European herbaria for authentic comparative materials. He was careful about going back to the type specimens for the verification of species concepts. On two occasions, in 1903 and again in 1930, he studied in various European centers for this purpose, but photographs of types played an important role in providing the basis for direct comparisons. In an earlier day, Asa Gray had studied many of these collections and in his own masterful way had set the pattern for subsequent workers. But Gray was not a field botanist and did not have at his command an intimate knowledge of many of our wild plants in their native haunts. As a result, there remained many problems for one of Fernald's talents. He knew the plants in the wild and with adequate collections of herbarium specimens to study in the laboratory, he was able to properly collate for the first time numerous species with their original descriptions and the specimens upon which they were based.

Gradually Fernald established himself as the leading authority on the flora of eastern North America and undoubtedly the pinnacle of his prestige among botanists of the world was reached upon the publication of the Eighth Edition of *Gray's Manual of Botany* in July, 1950. The rewriting and expansion of this century-old classic had absorbed a major portion of his energies for over fifteen years and he had been preparing for the task for a much longer time. As a young man he had collaborated with

B. L. Robinson in producing the Seventh Edition, published in 1908. But he had always been highly critical of that work and often remarked that it was done by a "specialist on the Compositae and a young man who knew nothing about the Flora." All will agree that during the more than forty years following his first participation in a revision of "the manual" he certainly corrected this deficiency. The Eighth Edition of *Gray's Manual* stands as a crowning achievement to a long and very active botanical career.

The results of much solid revisionary work were frequently interpolated into papers which otherwise dealt largely with floristics. But Fernald produced at least one large monograph that was a model of its kind.[1] In an extended review of this work W. H. Pearsall[2] writes as follows: "To students of the genus *Potamogeton* the publication of this excellent and exhaustive monograph is an event of outstanding importance. To British workers in a more restricted area it has always been a matter of surprise and regret that, with the exceptional facilities afforded by the great lakes and waterways of North America, no adequate attempt has previously been made by an American to critically study their Pondweeds. However, this reproach has now been removed, and we heartily congratulate Prof. Fernald upon the thoroughness, accuracy, and scientific value of his work. In our judgment the volume before us is superior in many ways to any existing account of the Potamogetons of this section."

Fernald was much interested in the distribution of the species of plants in space as shown by the frequency with which he dealt with this subject in his writings. This interest led ultimately to what are undoubtedly his most important generalizations in biology, for which he will be longest remembered. These generalizations grew out of an intensive study of floristic ranges. Early in his career, while exploring for plants on the Gaspé Peninsula and Newfoundland, he and his associates discovered numerous isolated species common to this region and the arctic, western America, the Atlantic Coastal Plain or western Europe. Later, similar discoveries were made in other areas of eastern

[1] The Linear-leaved North American Species of Potamogeton, Section Axillares. Mem. Amer. Acad. Arts & Sciences 27: 1–183. 1932.

[2] The Botanical Society and Exchange Club of the British Isles, Report for 1932. Vol. 10: 51–57. 1933.

Photo by W. H. Hodge

Fernald with His Class on Cape Cod, 1938.

North America. How to explain the disruptions in the ranges of these plants was the question he tried to answer. As succinctly written by Professor Raup,[3] "His most important work in the field of phytogeography probably was summarized in his paper, published in 1925, on the persistence of plants in unglaciated areas of Boreal America. In this paper he discussed the many enigmas of discontinuous range patterns manifested by so many plants in northeastern America, and, in so doing, presented a vast amount of specific evidence in support of the theory of persistence which had been so ably defended by Darwin. His work in this field has greatly stimulated research in two directions. One of these is in the re-examination by glacial geologists of the probable behavior of the Pleistocene ice in eastern America. Controversies raised in this connection still obtain. In another direction have been investigations of the inherent capacities of species to migrate, particularly as related to their genetic constitution and history. It is not impossible that in reemphasizing the theory of persistence and in stimulating studies of its modern implications, Professor Fernald has made the largest single contribution to phytogeography since Darwin."

Aside from his writings in taxonomy and phytogeography, Professor Fernald wrote entertainingly of his botanical expeditions to the Gaspé Peninsula, Newfoundland, and Virginia. These were journal accounts combining field botany, travel and many human interest incidents, all blended to give to the reader an extraordinary picture of a "botanist on location." His wide interest in the relationship of his own specialties to practical matters is demonstrated in a number of ways. For example, as mentioned in the preceding article by Professor Pease, one of his books, written with Professor A. C. Kinsey was entitled *Edible Wild Plants of Eastern North America.* Another instance is his participation as a consultant in the Labrador-Newfoundland boundary dispute argued before the Privy Council in London by the governments of the Dominion of Canada and the Colony of Newfoundland in 1926. His evidence that maritime plants found in the region of Hamilton Inlet extend westward to the head of Lake Melville was a decisive point in support of the territorial claims of the Newfoundland Government. A third

[3] Merritt Lyndon Fernald. Harvard University Gazette 46: 78. 1950.

instance was his participation in a lively discussion concerning the location of Wineland the Good. When he learned that some of the important evidence for locating the point of discovery of the North American continent by the Norsemen in Nova Scotia or New England was botanical, he immediately examined this evidence. Some of his conclusions, not necessarily concurred in by philologists and others, were that the wild grape or "vinber" of the Norse was probably mountain cranberry (*Vaccinium vitis-idaea*) rather than our Wild Grape (*Vitis labrusca*) and that their "self-sown wheat" was more probably Strand Wheat (*Elymus arenarius*) than Wild Rice (*Zizania aquatica*) as others contended. As a result of his studies, he was convinced that the old Icelandic sagas referred to Norse landings far to the north of New England or Nova Scotia, most probably along the Labrador coast.

As an editor and editor-in-chief of Rhodora for many years, Professor Fernald handled many botanical publications sent in for review. These stimulated him to write critiques and reviews, many of which have become classics of their kind. Often he would become exasperated when handling a manuscript or paper not meeting his standards of excellence and sometimes their authors would receive a verbal spanking. On one such occasion he was heard to remark "Yes, —— —— is a nice chap. His heart is in the right place. Wish I could say the same for his head." Certainly the whole man as a professional botanist would not stand inclusively touched upon were his role as a botanical critic not further mentioned. But here I turn to Dr. E. D. Merrill where in his citation of Professor Fernald at the presentation of the Leidy medal he has ably handled this aspect in the following words: "Fernald's published papers on various phases of botanical science exceed 700 [now over 750] in number. These, always highly critical, carefully prepared, well written, and full of the results of very keen observation, set an unusually high standard within their field. His trenchant criticisms of the work of others in the general field covered by his activities, while not always pleasing to those criticized, assist in maintaining the standards of American botanical scholarship. On one occasion when one of my former associates was requested to review a certain published paper, which was not all that it should have been, I heard him exclaim, 'Oh, for the pen of a Fernald.' In

practice, if an individual criticized attempts to maintain his thesis, that individual must be very certain of his ground."

Professor Fernald's has been a many-sided contribution to botany in spite of his ostensibly specialized field of activity. Throughout his work he was imaginative and had the stamina and singleness of purpose to follow through in his research studies to their logical fruition. His published work stands on its own merit but botany has lost an ardent and sometimes militant individualist of great vigor, keen insight and strong devotion to his chosen field.

FERNALD IN THE FIELD

Ludlow Griscom

Many people intensely enjoy watching others do something superlatively well. This enjoyment is greatly enhanced should the technique or field of activity impinge on one's own interest and requirements. It is part of a happy and very fortunate life that it has been my privilege to be afield with the world's greatest field botanists and ornithologists, and I have reflected for some time on the combination of assets and talents required to produce such an exceptional human being. In the ensuing discussion it must be understood that my friend, the late M. L. Fernald, possessed the necessary qualifications to an astonishing degree.

The principal objective of the field botanist is to find and collect in quantity plants of some critical or scientific interest. This obviously involves getting away from civilization and disturbed areas, and may even involve protracted camping, mountain climbing, or the organization of a real expedition, with numerous personnel, guides, porters and problems of transportation. This presupposes the necessary rugged *physique*. The legs must be stout, the back must be strong to carry a pack, the wind must be good, and *the eyesight must be remarkably keen.* Fernald might be described as a short, stout man, with short legs. In the Shickshock Mountains of Gaspé I had occasion to marvel at his ability to cope with the demands made on his physique, and at the same time, to feel very sorry for another old friend and companion with short legs, the late K. K. Mackenzie, whose heart could not stand the strain of mountain climbing, soon to die prematurely

of this defect. Fernald's keenness of eyesight was prodigious. By train his face was glued to the window, by car he hung as far out as safety permitted, constantly scanning the passing banks and roadsides, calling "stop" when something suspicious was sighted, and usually to good purpose. This was his pet method of turning up unusual weeds. It is trite to mention his indifference to extremes of heat, cold, wet, and insect pests.

Another must for a great field botanist is a memory for facts, so fabulous as to be completely beyond the capacity of the average person. Most local floras involve 2000 or more species. Think of the facts involved in committing to memory, almost perfectly, the characters in the descriptions of such a flora, even the most technically difficult genera such as *Viola* and its hybrids, *Carex*, the willows (*Salix*) in the far northeast. Moreover, the ranges must be accurately recalled, so as to pounce at once on any possible range extensions in the field. To illustrate, I remember one mortifying incident. Long interested in orchids, I was, so I thought, very familiar with *Habenaria Hookeri* Torr., so when I picked some, up in Gaspé, I thought little of it. But you should have seen Fernald jump when I mentioned it; he immediately recognized it as a range extension and made me go back to relocate the station to procure more material for the whole party!

Few people stop to think that a sense of location or place-memory is a great asset. Fernald had one of the most marvellous of any human being I have ever known, and his ability to return after many years to the station of some rare plant bordered on the incredible. Two illustrations must suffice. On the table-top of Mt. Albert I was particularly anxious to "clean up" on the great and local rarities, notably *Polystichum mohrioides* (Bory) Presl var. *scopulinum* (D. C. Eat.) Fern., the only eastern station. Speaking to Fernald, whose generosity and interest were notable, he reflected a moment. It required *crossing* the entire *tableland*, to find the right gulch or ravine on the opposite face of the mountain, where he had been once previously. Crossing the mountain and hitting the first gully by chance, Fernald said "wait a minute," and disappeared downwards, shortly to reappear, saying it was not the right one and he believed the one we were seeking was further to the left. So, to the left we tramped

and the next gully "began to look right." We were told to look for a big patch of July snow. There *was* such a snowpatch, and in a few minutes Fernald relocated the famous station. Only once did I see Fernald at fault. I had never collected *Scirpus Peckii* Britt., and recalled a sheet in the Gray Herbarium collected by Fernald at Alstead, N. H. He claimed to remember it well and volunteered to make a try at finding the station. So one day we took a long and rambling trip around the changed village of Alstead, while Fernald tried to recall the location of a moist swale, one of many in the hollow of some farming uplands. It could not be done. The point is that Fernald was clearly chagrined and mortified, in spite of the fact that *thirty-five* years had passed. I could not console him on the way home as he felt he had completely wasted my day, and he earnestly promised to make it up to me. He did, bless him, over and over again.

Long before I met Fernald or was in the field with him, I knew him by reputation as the great authority on the flora of New England, the Maritime Provinces of Canada, and Newfoundland. I therefore expected and was prepared for all the assets and qualifications outlined above just as I had found them in the late Dr. Karl M. Wiegand, who was just as sensational in his knowledge of the flora of the Cayuga Lake Basin, a more restricted area. The great question now arises, how does such a person perform in a new or unknown flora? This I was able to answer, as I was largely responsible for getting Fernald out of New England and well started on his field work in extreme southern and southeastern Virginia, handicapped as he was by having by-passed the famous pine-barren flora of New Jersey. One fine morning we left Cambridge at 5:30 a. m. and rolled the car on the ferry that night at Cape Charles, Va., 605 miles south. The results of the trip were written up in RHODORA, Vol. 37, under the title "Three days botanizing in southern Virginia." This field work, which continued with the aid of the greatly gifted Mr. Bayard Long, was delightfully written up in RHODORA, with many revisions and range extensions into the Manual area. Here we reach the final asset of a great field man, who does not know the flora, and who has never seen the plants growing before. The gift of a somewhat photographic memory combined with extensive reading plus the study of herbarium specimens, enabled

Fernald to recognize, spot, or at least suspect most of the well known southern element.

How well I recall joining a party in northern Newfoundland led by Fernald and Wiegand. There was a pleasant party rivalry at the time, each trying to spot the most novel, new, suspicious or interesting plants per day per trip. Wiegand did not do very well, and confided his chagrin to me, a former student, privately. Wiegand's summing up was perfectly fair, just and reasonable: "He did *not* know the arctic flora," and had had no time to study or bone up on it. One graphic illustration of the opposite faculty occurs to me. While the point could be debated among botanists indefinitely, it has always seemed to me that the hardest plants to "spot" are certain low growing shrubs minus flowers, buds, or fruit, when they become as nearly characterless as possible. Such a plant is the rare and local *Stewartia Malacodendron* L., minus the huge showy flowers or the prominent 5-locular capsule. I was just good enough to "spot" this low shrub in the rich welter of vegetation in a moist ravine of southern Virginia, and called it to Fernald's attention. I was electrified when he gave a cry of pleasure and immediately named it! I still haven't figured out how he did it!

In the field Fernald was noted for a kindly, sunny cheerfulness of temperament, good humor, a tendency to bad puns, and an optimism which sometimes discommoded his party. The guides and boatmen proved to be mortal and human, the landlady and food were not as wonderful as represented in advance, in short, the Golden Age was never quite attained on my last trip with him! He was kindness and patience itself to a ham amateur ornithologist like myself, but an unsparingly caustic critic of all entitled to be called botanists. In certain ways he was almost amazingly modest and unconscious of his gifts. Thus his discoveries in southern Virginia, far from puffing up his self esteem, were invariably represented as a reflection on the lack of energy and drive of the Washington, D. C., botanists, who "could have run down there in a day anytime they got around to it."

Actually it should be clear that this greatly gifted field botanist can be described as a one-pointed, one-sided botanical machine. Fernald lived, thought, and talked botany. In very bad weather, he would invent work with the presses, changing the driers, etc.

If there was nothing to do, Fernald would pick up a novel and in half an hour was sound asleep! I never knew him to finish one! The impact on other people was entirely a measure of their interest in or knowledge of botany. It went hard with them indeed if both were inadequate, and under the inevitable strain and fatigue they tended to lose sight completely of the great gifts their leader possessed so outstandingly. In addition to the strain of camping life, the constant physical exercise and discomfort, there is a terrible, grinding monotony to the constant pressing of 1000 sheets a week, the changing of the driers, the straightening of the material, the psychological impact of overwhelming and irreducible inferiority of knowledge. Some people could not endure it.

Nevertheless, as I look back on my trips with him over a fifteen year period, as I thumb through the new Gray's Manual, which happily he lived to see finished and out, and as I write these lines, there are tears of gratitude in my eyes, gratitude that I had the opportunity to see him as much as I did, and get to know him so well, to appreciate his extraordinary gifts. The reason why has just come to me upon reflection. As a professional field man, he had all the qualifications I wish I had myself, but never acquired as an amateur. Hence I admire, respect, and esteem his memory, and rejoice at the vision he gave me.

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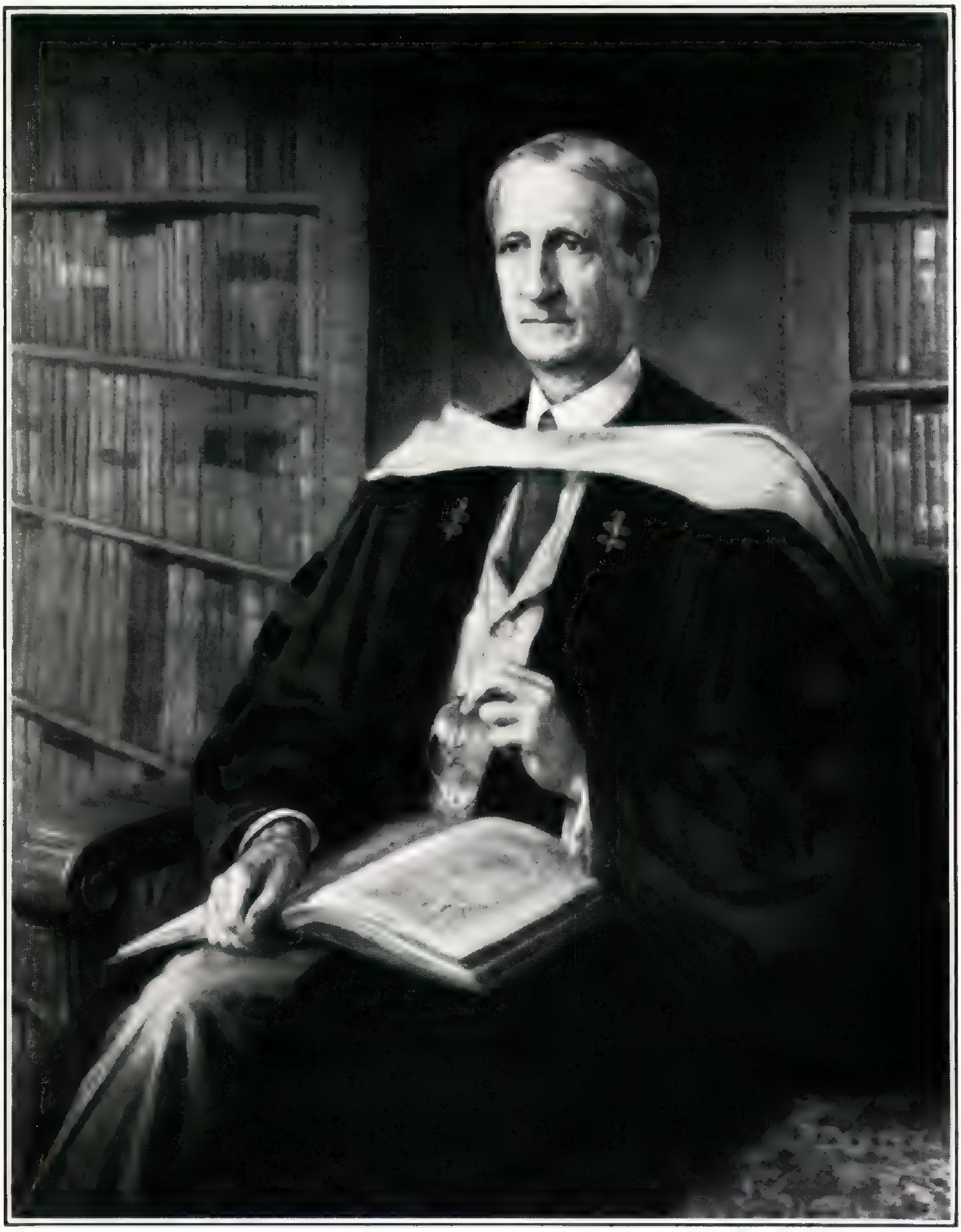
2. Revisions of Alomia, Ageratum and Oxylobus. By B. L. Robinson.
3. Some Combinations required by the International Rules. By C. A. Weatherby.
4. On the Gramineae collected by Prof. Morton E. Peck in British Honduras, 1905–1907. By F. Tracy Hubbard.
5. Diagnoses and Transfers among the Spermatophytes. By B. L. Robinson. .... $ .75

Gray Herbarium of Harvard University, Cambridge 38, Mass.



From a painting by Blanche Ames, 1946

OAKES AMES

Rhodora

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OAKES AMES, 1874–1950

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(With portrait)

TAXONOMIC botany has become a great science mainly through the efforts and consecration of outstanding builders—men who, with respectful trust in the past and hopeful faith in the future, have studied and amassed material on which scientific progress can be made.

We have recently lost one of the great builders in taxonomic botany. On April 28, 1950, Professor Oakes Ames passed away at his winter home in Ormond, Florida, in his 76th year. Internationally known, particularly as a leading orchidologist, his botanical and horticultural activities were devoted with equal success and enthusiasm to research, to teaching, and to administration for more than half a century at Harvard University.

Son of Oliver Ames, a financier and once Governor of the Commonwealth of Massachusetts, and Hannah Coffin Ray Ames, and grandson of Oakes Ames, one of the builders of the Union Pacific Railroad, Oakes Ames was born in North Easton (near Boston), Massachusetts, on September 26, 1874.

His interest in horticulture and botany began early in life, "when, as a boy, he joined his father . . . in the hobby of collecting and identifying the wild flowers of the New England countryside. Young Ames, setting for himself the goal of learn-

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ing the name of one new plant each day, began a serious study of the local flora of North Easton, and with a tin biscuit box to serve as a vasculum he roamed the woods and countryside, imagining himself to be exploring strange and distant lands."[2]

He prepared for his university career at Noble & Greenough School in Boston and entered Harvard College in 1894, receiving his A.B. in 1898 and his A.M. from the same institution the following year.

Immediately after receiving his A.M. degree, he began his teaching activities at Harvard, serving from 1900 to 1910 as Instructor of Botany. In 1915, he was named Assistant Professor of Botany, a chair which he held until 1926 when, under President A. Lawrence Lowell, he was appointed Professor of Botany. He served his University in this capacity for six years. Then, from 1932 to 1935, he held the chair of Arnold Professor of Botany and, from 1935 to 1941, Research Professor of Botany. In 1941, Ames retired from his teaching duties, holding the title of Research Professor of Botany, Emeritus, until his death. In 1927, he was named by President Lowell as a member of the Administrative Board of the Graduate School of Arts and Sciences, and, in 1929, as Chairman of the Committee on General Examinations.

Although it is difficult, if not impossible, to consider Ames' teaching and research apart from his administrative activities, so closely were they allied, we may enumerate his administrative appointments separately. From 1898 to 1909, he served as Assistant Director of the Botanical Garden, taking over its complete administration as Director for the next thirteen years, from 1909 to 1922. As early as 1900, Ames, with Professor George Lincoln Goodale, was influential in persuading Mr. Edwin F. Atkins of Boston to establish the Atkins Garden in Cuba. Ames administered this as a dependency of the Botanical Garden in Cambridge for a number of years, since President Lowell did not at first grant the Cuban Garden independent status as a branch of the University. Ames' efforts on behalf of the new-born tropical garden, though not officially recognized by the University, are recorded in his annual reports to the President.

In 1923, he became Curator of the Botanical Museum, a post

[2] Most of the quotation given are from the biographical sketch by P. C. Mangelsdorf in Oakes Ames "Orchids in Retrospect" (1948), Cambridge, Mass.

he held until 1927, when he was appointed Supervisor of the same institution. Later he was named Director of the Botanical Museum by President James B. Conant. He filled this post with characteristic enthusiasm from 1937 to 1945, when, at his own request, he became Associate Director, relinquishing active administration but preserving, until the time of his death, a vital interest in the current research and publications of the Museum.

One of the most demanding of administrative periods during Ames' half century of service at Harvard was from 1927 to 1935, when he was Chairman of the Council of Botanical Collections and Supervisor of the Biological Laboratories as well as of Harvard's Botanical Garden in Cuba and the Arnold Arboretum. This exacting appointment followed the brilliant work he carried out as Chairman of the Committee on the Future Work and Needs of the University in Biology, a post to which he was named in November 1926 by President Lowell. During this whole period, Ames was active in enlisting additional financial support and in creating new entities for biology at Harvard. As Supervisor of the Arnold Arboretum, he more than doubled the endowment of that institution by raising the Charles Sprague Sargent Memorial Fund. The Biological Laboratories at Harvard owe much to his efforts and foresight, for, as Chairman of the Building Committee and subsequently as Supervisor of the Biological Laboratories, he was a leader in drawing up the plans and constructing the large and modern building now housing most of Harvard's experimental biology. Furthermore, he was instrumental in raising extensive financial support for this building and, later, he guided the difficult pioneer amalgamation of three independent departments into the single Department of Biology. It has truly been said of Ames: "Seldom in the history of Harvard University has one man been called upon to fill so many important posts."

When Ames was still a very young man, he became deeply interested in the orchids. It was apparently through two steps that he entered into orchidology. One day, as a boy, he went into his father's room and noticed two flowers of *Dendrobium nobile* in a glass on a table at his father's bedside. These two lone flowers shed such a warm diffusion of color on the otherwise dull scene that Ames was magnetized by their beauty. He

himself later said: "Then and there, I fell in love with orchids and began a collection of my own, using my pitifully small allowance to satisfy my fancy. Cypripediums were cheap, and with them I laid the foundation of a collection which grew by leaps and bounds. Before long I was overwhelmed by the fascination of orchids as a group."

The second step—and the one which crystallized his resolution to devote his academic life to the orchids—was a conversation with Doctor N. L. Britton of the New York Botanical Garden. Sensing the young man's keen interest in the orchids and appreciating in him the qualities of a sound taxonomist, Britton pointed out to Ames that the classification of the *Orchidaceae* was almost hopelessly confused and infantile. He put it up to Ames that to make order of this chaos would need not only a brilliant taxonomist, but extensive financial support. Finally, he suggested that since Ames had the interest, the ability and the wealth, he should make the orchids his field. Ames took the suggestion and immediately began to amass material on a large scale. This decision "has borne rich botanical fruit" for "today, and in no small measure because of his work and that of his associates, the species of the *Orchidaceae* have probably been more thoroughly studied and more completely classified than those of any of the other larger plant families."

The large collection of living orchids which he had built up at his home at North Easton, where he also established the Ames Botanical Laboratory, led him deeper and deeper into an inquisitiveness about the classification, structure and function of the orchids. Eventually, he donated this living collection to the New York Botanical Garden, and gradually transferred most of the Ames Botanical Laboratory to the Harvard Botanical Museum in Cambridge, concentrating his major research efforts in the field of orchid taxonomy.

The Ames Orchid Herbarium, which now comprises 65,000 critically determined specimens as well as large numbers of line drawings, tracings and photographs of type material from the large orchid herbaria of Europe, has become the largest single orchid herbarium in the world. Only the Lindley Herbarium at Kew and the Reichenbach Herbarium in Vienna are comparable in scope; and the Ames Orchid Herbarium has become the center

for most of the taxonomic studies on the orchid flora of the Philippine area and of the New World. His herbarium is unique in having an extensive collection of critically determined floral dissections preserved on glass slides in small metal cabinets, an invaluable aid in rapid determination of new material and in monographic work. Professor Ames gathered together an unusually complete working library of orchid literature, including current journals, from all parts of the world; it forms an integral part of the herbarium. Both the herbarium and the library, now housed in the Botanical Museum in Cambridge, were given to Harvard University in 1941.

In 1904 and 1905, Ames began to publish important taxonomic contributions in the orchid family and, in 1908, appeared his account of the Orchidaceae for the 7th edition of "Gray's New Manual of Botany." His interest and activity in this family soon widened, however, when, in the same period, he undertook the vast task of identifying the orchids of the Philippines, becoming eventually the leading authority on the family for that part of the world. It was early apparent to Ames that nothing could be accomplished without access to the type or classical collections which his European predecessors, Lindley, Reichenbach and others, had accumulated and studied. Accordingly, in 1905, he left to study important European orchid collections and, with his two assistants, Mr. R. G. Leavitt, and Mr. A. A. Eaton, he visited Kew and the British Museum, the Musée d'Histoire Naturelle in Paris and the Rijksherbarium in Leiden.

Ames' work on the orchids became even more extensive and gradually embraced many other parts of the world, especially Florida and the Caribbean area as well as Middle and South America. The collections of Ames and Eaton in Florida led to the publication early in his career of an article entitled "Additions to the Orchid Flora of Southern Florida." This interest in the orchids of Florida, where Ames spent every winter, continued all through his life and was the basis of a number of papers and, very recently, of an extensive book. This book, entitled "Drawings of Florida Orchids" he published jointly with Mrs. Ames who had done all of the illustrations throughout his years of research. His studies of the orchids of Middle and South America prompted him to make trips to Honduras and Brazil. In a

little brochure entitled "Rediscovery of a Lost Orchid" he tells, in his own charming style, the story of his almost accidental finding of an orchid which had never been seen since the type collection.

Professor Ames was fortunate in having as his life-long companion Blanche Ames, an accomplished artist who illustrated all of his technical papers with extraordinarily artistic and accurate line drawings and etchings of the hundreds of new species. This close collaboration between Professor Ames and his wife is almost unique in the history of botany and has led to the publication of some of the most delightful scientific works ever to appear. In 1922, as soon as the Reichenbach Herbarium was opened after it had, in accordance with Reichenbach's will, been sealed from botanical eyes for twenty-five years, Ames and his wife visited Vienna for an exhaustive study of types in this collection. Mrs. Ames executed drawings and analytical sketches of most of the essential material in the Reichenbach and other herbaria for the Ames Orchid Herbarium.

For eighteen years, from 1905 to 1922, Ames, with his wife and sometimes with his collaborators, published a series of seven fascicles entitled "Orchidaceae: Illustrations and Studies of the Family Orchidaceae." Included in these fascicles was a diversity of taxonomic studies comprising the descriptions of new species from the Philippines, British North Borneo and tropical America, monographic work of North American genera such as *Habenaria, Pogonia,* and *Spiranthes,* and miscellaneous nomenclatural transfers. This series of fascicles gave way, when research began greatly to increase the output of orchid studies, to a series of papers called "Schedulae Orchidianae" which, with the collaboration of his colleague Mr. Charles Schweinfurth, appeared in ten numbers, extending from 1922 to 1930. Ames, Hubbard and Schweinfurth's "The Genus Epidendrum in North and Middle America," published in 1938, will long remain a model of painstakingly exact taxonomic work.

In recent years Professor Ames' writings on the orchids, have tended to be more philosophic than descriptive and have shown an astonishingly wide range of interest and a profound understanding of all aspects of orchidology, especially the lore of orchidology in the medieval herbals. These papers cover such

a diversity of topics as: "Seed Dispersal in Relation to Colony Formation in *Goodyera pubescens*," "The Evolution of the Orchid Flower," "The Mycorrhiza of *Goodyera pubescens*," "Resupination as a Diagnostic Character in the Orchidaceae, with special reference to *Malaxia monophyllos*," "Pollination of Orchids through Pseudo-copulation," "Observations on the Capacity of Orchids to Survive in the Struggle for Existence," "The Origin of the term Orchis." He frequently contributed articles to the American Orchid Society Bulletin and wrote the "Enumeration of the Orchids of the United States and Canada" for the American Orchid Society. Ames' bibliography numbers more than 300 papers or books on orchids, and in these he described more than 1,000 new species.

Although Oakes Ames will undoubtedly be remembered primarily as the leading orchidologist of his day, he devoted much of his time and interest to economic botany and has so profoundly influenced thought and teaching in this broad field that he must be counted one of the outstanding economic botanists of this century. Ames' first contact with economic botany came during his association with Professor Goodale, his predecessor at the Botanical Museum, who had begun to assemble material and data for exhibits and teaching in this subject. In 1909, Ames himself taught a course which he entitled "Outlines of Economic Botany." His serious interest in the subject took deep roots when in 1914 and 1915 Professor East invited him to offer a course in botany at the Bussey Institution of Applied Botany at Harvard.

As a graduate student, he began to accumulate his own herbarium of plants, wild and cultivated, upon which civilized and primitive man depends for his life. This herbarium, now housed in the Botanical Museum and known as the Economic Herbarium of Oakes Ames, has grown to include 18,000 specimens; it was given to the University in 1940. At the same time, Ames, with the loyal help of Mr. Louis C. Bierweiler, continued to increase the general collection which had been started by Goodale, until, to-day, it is an enormous and enviable collection of plant parts, fibres, woods, extracts and other products which are basic to teaching and research in this field.

Along with the herbarium and plant products collection,

Ames accumulated a unique library of literature on useful plants. This treasury of documents, now known as the Oakes Ames Library of Economic Botany, he liked to refer to as a "gentleman's library"; it comprises approximately 16,000 volumes, pamphlets, theses and reports and has, in addition, a newspaper clipping file. The library covers all aspects—botanical, anthropological, geographical, pharmacological, chemical and agricultural—of useful plants, exclusive of ornamentals. It is most completely indexed as to author, subject (by vernacular and technical name), subject heading, and plates: the work of Ames himself and his associate for many years, Mr. F. Tracy Hubbard. The economic herbarium and library together form a unit unexcelled for completeness in the world.

With this extensive and unique background available to his students, Ames offered his course in economic botany, a course carried on and enlarged to-day by his successor, Professor Paul C. Mangelsdorf. It was, in fact, *only* in economic botany that Ames taught, since no formal courses in the University were ever offered in orchidology. Besides this yearly course—taken eagerly by concentrators in biology, in pre-medical studies, and even in the classics—Ames offered lectures in economic botany and carried out research upon poisonous plants at the Harvard Medical School. Although Professor Ames himself might not have admitted it, he thoroughly enjoyed teaching. Using completely unorthodox methods (preferring to call his lectures "chats") and utterly disregarding fact-cramming, he succeeded in quietly guiding his students into paths of original research which often led them to fields far removed from his own.

Ames' publications in the field of economic botany are few but outstanding. His book "Economic Annuals and Human Culture," written in 1940, has taken its place as one of the most outstandingly original contributions to the whole philosophy of the inter-relationship between plants and man. Written in his clear and concise style, this book developed the thesis that all civilization was dependent upon the angiosperm seed which gave man the chance to invent agriculture; that, later, the seed provided leisure time for him to develop arts and crafts; furthermore, that the annual habit of growth had made it possible for man to subdue plants to his will and to create great surpluses which

increased the amount of leisure time available to him. He argued strongly and convincingly, on the basis of the evidence of the extreme advancement and specialization of our cultivated food annuals, for a far greater age for agriculture, especially in the Americas, than anthropologists were prone to allow. Ames lived to see the soundness of his thesis gain support by several extraordinary archaeological finds which have recently been made.

One of the greatest contributions to the teaching of economic botany, but one which, unfortunately, has never been published, are the so-called "Ames Charts" upon which his course in economic botany at Harvard was based. These are charts showing in the form of a tree the phylogenetic relationships of the more important useful plants. Planned by Professor Ames and beautifully executed in water-color by Mrs. Ames, they have served to orient many a young man overwhelmed with the complexity of plant classification systems.

Although far afield from his own personal interests, paleobotany also felt Ames' influence. Shortly after becoming Director of the Botanical Museum, he decided that the long neglected paleobotanical collection in the Museum—one of the largest in the United States and probably the richest in type and classic material—should again be activated; and it was largely through his own efforts that Mr. William C. Darrah came to Harvard and began research and teaching in paleobotany.

An artist and perfectionist at heart, Professor Ames insisted almost fanatically upon the highest quality in paper, printing and composition to set the highest of standards in scientific publications. He deplored the increasing cheapening of paper and printing in our modern scientific journals. Most of the earlier orchid work of Ames and his associates was privately printed by the best presses in New England. When he became Director of the Botanical Museum, however, Professor Ames decided that an institution as active in such diverse botanical endeavors as he planned to make the Museum needed its own journal. Accordingly, he founded the "Botanical Museum Leaflets of Harvard University." This periodical, issued irregularly in ten numbers to a volume, handsomely illustrated and printed artistically by hand-set type on high-grade paper, is now

in its fourteenth volume and is an outlet for research done by members of the Museum staff. Many botanists are agreed that the establishment of this publication is not the least of Ames' contributions to Harvard Botany and to science in general and that his insistence on the highest of publication standards for scientific output is a refreshing sign in the midst of general deterioration of standards in publishing.

In 1924, the Gold Medal of the American Orchid Society was awarded to Professor Ames for eminent service to orchidology, and five years later he was the recipient of the Centennial Medal of the Massachusetts Horticultural Society for his researches in orchidology. He earned the George Robert White Medal of Honor in 1935 for eminent services in horticulture. In awarding Professor Ames the honorary degree of Doctor of Science in 1938, the President of Washington University stated: "He calls the orchids by name in order that others may likewise know them. Final authority, whose published works, illumined by the accurate, artistic skill of Blanche Ames, his wife, are at once the admiration and envy of the botanical world."

One of the earliest of the many honors conferred upon Oakes Ames, and one which he esteemed very highly throughout his career was his election, on December 7, 1905, as Fellow of the Linnaean Society of London. He was a member and vice-president (1923–1926) of the New England Botanical Club, an honorary member of the American Orchid Society and one of its vice-presidents from its inception in 1921 until his death, honorary vice-president of the Canal Zone Orchid Society, a member of the American Academy of Arts and Sciences and Sigma Xi, and Fellow of the American Association for the Advancement of Science. Amongst the other learned societies to which he belonged, we may enumerate the Botanical Society of America, American Society of Naturalists, Boston Society of Natural History, Biological Society of Washington, New York Academy of Science, Washington Academy of Science, National Institute of Social Science, Association Internationale des Botanistes, Orchid Circle of Ceylon, Torrey Botanical Club, American Fern Society, and the Sullivant Moss Society.

Perhaps the honor and tribute which touched Professor Ames most deeply was the "Fifty-year Dinner" tendered him at Har-

vard University by a group of his colleagues in 1948. On this happy occasion, marking the completion of fifty years of service at Harvard, Professor Ames was unexpectedly presented with "Orchids in Retrospect," a volume beautifully published by the press which he himself had established at the Botanical Museum. This volume brings together a number of Ames' essays on orchidology which "reveal him as his friends know him best in conversation and correspondence, an 'elder statesman' who, rich in the mature wisdom of a lifetime of experience, refuses to take himself, or his subject, too seriously."

On May 15, 1900, Professor Ames married Blanche Ames of Lowell, Massachusetts, and six years later established their lifelong home—"Borderland"—at North Easton. He is survived by Mrs. Ames and by four children, Mr. Oliver Ames of Beverly Farms, Massachusetts, Mrs. Francis T. P. Plimpton of New York City, Mr. Amyas Ames of Cold Spring Harbor, New York, and Mrs. J. Pascall Davis of Nashville, Tennessee.

It would be hard to find a statement more aptly keystoning Oakes Ames' underlying philosophy of life than the Ames family motto: "Fama candida rosa dulcior." His life's work was, indeed, patterned in accord with a deep feeling that a good name is sweeter than a rose. The most outstanding characteristic of Professor Ames' personality was undoubtedly a devotion to his conception of right and justice, and his intolerance of any deviation from these ideals. Another notable characteristic was a combination of calmness of mind with persistence to finish whatever work was at hand. Ames' numerous financial and business commitments would most certainly have proved too distractive a handicap for such a prodigious amount of meticulous scientific research unless he had disciplined his every activity in line with this serene tenacity of purpose.

It is paradoxical that a scholar of such international fame was personally known by so few of his fellow scientists. Oakes Ames was a very shy and retiring man; he disliked large gatherings and fanfare and almost never attended scientific meetings. As a result, few American botanists ever met him. This natural reserve can also be seen in the extreme caution which pervades his scientific writings. From a hasty reading of some of his papers, one might easily assume that Ames lacked confidence in

his grasp of the subject. A closer study, however, provides convincing evidence that Ames was very slow to make any categorical statement, but that when long study and thought had convinced him that he was right, his opinions were set forth fearlessly and without equivocation.

Ames has rightly been called a "perfectionist." His search for the best in all of his scientific endeavors is well known in botanical circles where the factual accuracy of his writings and the completeness of his plant descriptions is so well appreciated. His more philosophical writings sparkle with musical preciseness, and the most abstruse topics are treated with a delightful sprightliness which is often crowned with his whimsical humor. The constant striving towards perfection which early led him to choose the writings of Spenser as his model is seen in his most learned volumes and in his most casual letters.[3]

Like so many other New Englanders, Ames was conservative in politics and liberal in religion. He found little or no conflict between his scientific and his religious philosophy; perhaps the two were one to him. He frequently told his students that they ought to approach their scientific careers with the humbleness which Tennyson expressed in his "Flower in the crannied wall," advice not often heard in these days of materialism. A life-long member of the Unitarian Church of North Easton, Professor Ames' philosophical and religious thinking seemed to be guided by a respectful agnosticism which rebelled at the blind acceptance of authoritarian dogma. His colleagues and students will remember him as a man who, notwithstanding the extent and complexity of his attainments, led a life which was full and fruitful because it was fundamentally so simple.

[3] An illustration follows from an Ames letter to R. E. Schultes, September 5, 1949. "I am more convinced than ever that we must go on naming the fundamental units of evolution. Only an uninformed, a prejudiced or a narrow-minded soul can fail to understand the need for a comprehensive knowledge of every plant and animal to which we owe the urge of life. Charles Darwin wrote the great Bible of Biology only after he had become steeped in the study of species. Certainly Darwin did not turn to 'The origin of species' with an Aristotelian approach. Examine his early studies. This will prove that just a trip round the world cannot make one create thoughts that shatter a shibboleth. Darwin was a systematist in origin and at heart long before he began to build his untottering structure of biological philosophy. Think of Darwin fussing with little Cirripedes at a time when he had to create a new suborder to receive a new Chilean species. His study of Cirripedes should be read by every university president as an introduction to the book which shook the foundation of philosophical thought."

TENTH REPORT OF THE COMMITTEE ON PLANT DISTRIBUTION

The ninth report concluded the family *Gramineae.* The *Cyperaceae,* which would logically follow, have already been dealt with by Prof. Fernald (Rhodora vi. 34). The present report begins with the *Araceae* and with one exception includes the final families of the *Monocotyledoneae,* taken in the order of the eighth edition of Gray's Manual. The *Juncaceae* are not treated, as Prof. Fernald has already done so in a previous report (Rhodora x. 135). Although the *Orchidaceae* were published on by Mr. Emile F. Williams in 1902 (Rhodora iv. 18), they are discussed again at this time.

The data for these reports has been compiled chiefly from the Gray Herbarium and the herbaria of the New England Botanical Club, the Connecticut Botanical Society, the New England Museum of Science, Yale University, the Portland Society of Natural History, Bates College and the University of Maine.

We are indebted to the authorities of the various institutions above mentioned for the privilege of consulting the herbaria under their care and we are particularly indebted to the late C. A. Weatherby for his help and guidance in the preparation of this report.

PRELIMINARY LISTS OF NEW ENGLAND PLANTS—XXXV

The sign + indicates that an herbarium specimen has been seen; the sign – that a reliable printed record has been found.

	Me.	*N. H.*	*Vt.*	*Mass.*	*R. I.*	*Conn.*
Araceae						
Acorus Calamus L.	+	+	+	+	+	+
Arisaema atrorubens (Ait.) Blume	+	+	+	+	+	+
Arisaema atrorubens f. viride (Engler) Fern.	+	+	+	+	+	
Arisaema atrorubens f. zebrinum (Sims) Fern.	+		+	+	+	
Arisaema Dracontium (L.) Schott		–	+	+		+
Arisaema Stewardsonii Britton	+	+	+	+	+	+
Arisaema triphyllum (L.) Schott				+		+
Arisaema triphyllum f. pusillum (Peck) Fern.				+		+
Calla palustris L.	+	+	+	+	+	+
Orontium aquaticum L.				+	+	+
Peltandra virginica (L.) Schott and Endl.	+	+	+	+	+	+
Peltandra virginica f. brachyota Blake		+		+		
Peltandra virginica f. hastifolia Blake	+	+		+	+	+

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Peltandra virginica f. heterophylla (Raf.) Blake				–		
Peltandra virginica f. latifolia (Raf.) Blake	+			+	+	+
Symplocarpus foetidus (L.) Nutt.	+	+	+	+	+	+
LEMNACEAE						
Lemna minor L.	+	+	+	+	+	+
Lemna perpusilla Torr.				+	–	
Lemna trisulca L.	+	+	+	+	+	+
Lemna valdiviana Philippi		+		+	+	+
Spirodela polyrhiza (L.) Schleid.	+	+	+	+	+	+
Wolffia columbiana Karst.			–	+		+
Wolffiella floridana (J. D. Sm.) Thompson				+		
XYRIDACEAE						
Xyris caroliniana Walt.	+	+	+	+	+	+
Xyris caroliniana f. phyllolepis Fern.				–		
Xyris Congdoni Small	+			+	+	+
Xyris montana Ries.	+	+	+	+	+	+
Xyris torta Sm.		+		+	+	+
ERIOCAULACEAE						
Eriocaulon Parkeri Robinson	+			+		+
Eriocaulon septangulare With.	+	+	+	+	+	+
COMMELINACEAE						
Commelina communis L.			–	+	+	+
Commelina diffusa Burm. f.				+		
Commelina virginica L.			–			
Tradescantia ohioensis Raf.				+		+
Tradescantia ohioensis x subaspera				+		
Tradescantia ohioensis x virginiana	+	+		+		+
Tradescantia subaspera Ker.			–			
Tradescantia virginiana L.	+	–	–	+		+
PONTEDERIACEAE						
Heteranthera dubia (Jacq.) Macm.	+		+	+		+
Heteranthera reniformis R. & P.						+
Pontederia cordata L.	+	+	+	+	+	+
Pontederia cordata f. angustifolia (Pursh) Solms	+			+	+	+
Pontederia cordata f. latifolia (Raf.) House	+	+	+	+	+	+
Pontederia cordata f. taenia Fassett	–					
LILIACEAE						
Aletris farinosa L.	+	+		+	+	+
Allium canadense L.	+	+	–	+	+	+
Allium fistulosum L.			+			
Allium oleraceum L.				+		
Allium Schoenoprasum L. var. sibiricum (L.) Hartm.	+	+	+			–
Allium tricoccum Ait.	+	+	+	+	+	+
Allium vineale L.				+	+	+
Asparagus officinalis L.	+	+	+	+	+	+
Chamaelirium luteum (L.) Gray				+		+
Clintonia borealis (Ait.) Raf.	+	+	+	+	+	+
Colchicum autumnale L.		+				
Convallaria majalis L.	+		+	+	+	+
Erythronium americanum Ker.	+	+	+	+	+	+
Erythronium americanum f. castaneum L. B. Smith				+		

	Me.	*N. H.*	*Vt.*	*Mass.*	*R. I.*	*Conn.*
Hemerocallis flava L.			−	+		+
Hemerocallis fulva L.	+	+	+	+	+	+
Hosta japonica (Thunb.) Voss						+
Hosta ventricosa (Salisb.) Stearn				+	+	−
Lilium canadense L.	+	+	+	+	+	+
Lilium canadense f. rubrum Britton			+			
Lilium philadelphicum L.	+	+	+	+	+	+
Lilium philadelphicum f. flaviflorum E. F. Williams	+	+		+		+
Lilium superbum L.		−		+	+	+
Lilium tigrinum Ker.	+	+	+	+	+	+
Maianthemum canadense Desf.	+	+	+	+	+	+
Medeola virginiana L.	+	+	+	+	+	+
Melanthium hybridum Walt.						−
Muscari botryoides (L.) Mill.			+	+	+	+
Muscari racemosum (L.) Mill.				+		+
Ornithogalum umbellatum L.	+		+	+	+	+
Polygonatum biflorum (Walt.) Ell.						+
Polygonatum canaliculatum (Muhl.) Pursh		+	+	+	+	+
Polygonatum latifolium (Jacq.) Desf.				+		
Polygonatum pubescens (Willd.) Pursh	+	+	+	+	+	+
Polygonatum pubescens f. fultius Fern. & Harris			−	+		
Scilla sibirica Andr.				+		
Smilacina racemosa (L.) Desf.	+	+	+	+	+	+
Smilacina racemosa var. cylindrata Fern.		+	+	+	+	+
Smilacina stellata (L.) Desf.	+	+	+	+	+	+
Smilacina stellata var. cressa Vict.				+		+
Smilacina trifolia (L.) Desf.	+	+	+	+	+	+
Smilax Bona-nox L. var. hederaefolia (Beyr.) Fern.				+		
Smilax glauca Walt. var. leurophylla Blake				+	+	+
Smilax herbacea L.	+	+	+	+	+	+
Smilax pulverulenta Michx.					+	
Smilax rotundifolia L.	+	+		+	+	+
Smilax tamnoides L. var. hispida (Muhl.) Fern.						−
Streptopus amplexifolius (L.) DC. var. americanus Schultes	+	+	+	+		+
Streptopus amplexifolius var. oreopolus (Fern.) Fassett	+	+				
Streptopus roseus Mich. var. perspectus Fassett	+	+	+	+	+	+
Tofieldia glutinosa (Mich.) Pers.	+	+	+			
Trillium cernuum L.	+	+	+	+	+	+
Trillium cernuum var. macranthum Wieg.			+	+		+
Trillium erectum L.	+	+	+	+	+	+
Trillium erectum f. albiflorum R. Hoffm.	+			+		
Trillium erectum f. luteum Louis-Marie	+	+	+	+		+
Trillium grandiflorum (Michx.) Salisb.	+	+	+	−		+
Trillium undulatum Willd.	+	+	+	+	+	+
Trillium undulatum f. Cleavelandicum (Wood) Fern.	+	+				
Trillium undulatum f. polymerum Victorin	+	+	+	+		
Uvularia grandiflora Sm.		+	+	+		+
Uvularia perfoliata L.			+	+	+	+
Uvularia sessilifolia L.	+	+	+	+	+	+
Veratrum viride Ait.	+	+	+	+	+	+
Yucca Smalliana Fern.				+		+
Zigadenus glaucus Nutt.			+			

	Me.	*N. H.*	*Vt.*	*Mass.*	*R. I.*	*Conn.*
Haemodoraceae						
Lachnanthes tinctoria (Walt.) Ell.				+	+	+
Dioscoreaceae						
Dioscorea villosa L.				+	+	+
Dioscorea villosa f. glabrifolia (Bartlett) Fern.					+	+
Amaryllidaceae						
Hypoxis hirsuta (L.) Coville	–	+	–	+	+	+
Leucojum aestivum L.	+					+
Narcissus poeticus L.	–			–		+
Narcissus Pseudo-Narcissus L.			–	+		–
Iridaceae						
Belamcanda chinensis (L.) DC.			+			+
Crocus vernus All.				+		
Iris germanica L.				–		+
Iris Hookeri Penny	+					
Iris laevigata Fisch.						–
Iris orientalis Mill.						+
Iris prismatica Pursh	+	+		+	+	+
Iris prismatica x versicolor				+		
Iris pumila L.	+					
Iris Pseudacorus L.			+	+	+	+
Iris versicolor L.	+	+	+	+	+	+
Sisyrinchium angustifolium Mill.	+	+	+	+	+	+
Sisyrinchium arenicola Bicknell				+	+	+
Sisyrinchium atlanticum Bicknell	+	+	+	+	+	+
Sisyrinchium montanum Greene var. crebrum Fern.	+	+	+	+	+	+
Sisyrinchium mucronatum Michx.	+		+	+		+
Orchidaceae						
Aplectrum hiemale (Muhl.) Torr.			+	+		–
Arethusa bulbosa L.	+	+	+	+	+	+
Calopogon pulchellus (Salisb.) R. Br.	+	+	+	+	+	+
Calypso bulbosa (L.) Oakes	+	+	+	+		
Corallorhiza maculata Raf.	+	+	+	+	+	+
Corallorhiza maculata f. flavida (Peck) Farwell	+		–			–
Corallorhiza odontorhiza (Willd.) Nutt.	+		+	+	+	+
Corallorhiza odontorhiza f. flavida Wherry						–
Corallorhiza trifida Chatelain var. verna (Nutt.) Fern.	+	+	+	+	+	+
Cypripedium acaule Ait.	+	+	+	+	+	+
Cypripedium acaule f. albiflorum Rand & Red.	+	+	–	–		
Cypripedium arietinum R. Br.	+	+	+	+		
Cypripedium Calceolus L. var. parviflorum (Salisb.) Fern.	+	+	+	+		+
Cypripedium Calceolus L. var. pubescens (Willd.) Correll	+	+	+	+	+	+
Cypripedium reginae Walt.	+	–	+	+		+
Epipactis Helleborine (L.) Crantz		–	+	+		+
Goodyera oblongifolia Raf.	+		–			
Goodyera pubescens (Willd.) R. Br.	+	+	+	+	+	+
Goodyera repens (L.) R. Br. var. ophioides Fern.	+	+	+	+		+
Goodyera tesselata Lodd.	+	+	+	+		+
×Habenaria Andrewsii M. White (lacera x psycodes)	+	+	+	+		+
Habenaria blephariglottis (Willd.) Hook.	+	+	+	+	+	+

	Me.	*N. H.*	*Vt.*	*Mass.*	*R. I.*	*Conn.*
Habenaria ciliaris (L.) R. Br.			–	+	+	+
Habenaria cristata (Michx.) R. Br.				+		
Habenaria clavellata (Michx.) Spreng.	+	+	+	+	+	+
Habenaria clavellata var. ophioglossoides Fern.	+	+	+	+	+	
Habenaria dilatata (Pursh) Hook.	+	+	+	+		+
Habenaria fimbriata (Ait.) R. Br.	+	+	+	+	+	+
Habenaria fimbriata f. albiflora Rand & Redfield	+	+				
Habenaria fimbriata f. mentotonsa Fern.	+					
Habenaria fimbriata x hyperborea			–			
Habenaria flava (L.) Spreng. var. herbiola (R. Br.) Ames & Correll	+	+	+	+	+	+
Habenaria Hookeri Torr.	+	+	+	+		+
Habenaria hyperborea (L.) R. Br.	+	+	+	+	+	+
Habenaria hyperborea var. huronensis (Nutt.) Farw.			–			
Habenaria lacera (Michx.) Lodd.	+	+	+	+	+	+
Habenaria leucophaea (Nutt.) Gray	+		–			
Habenaria macrophylla Goldie	+	+	+	+		–
×Habenaria media (Rydb.) Niles		–	+			
Habenaria obtusata (Pursh) Richards.	+	+	+	+		
Habenaria orbiculata (Pursh) Torr.	+	+	+	+		–
Habenaria psycodes (L.) Spreng.	+	+	+	+	–	+
Habenaria psycodes f. albiflora (Bigel.) R. Hoffm.			–	–		
Habenaria psycodes f. ecalcarata (Bryan) Dole			–			
Habenaria viridis (L.) R. Br. var. bracteata (Muhl.) Gray	+	+	+	+	+	+
Isotria medeoloides (Pursh) Raf.	–	+		+	+	+
Isotria verticillata (Willd.) Raf.	+	+	+	+	+	+
Liparis liliifolia (L.) Richard		–	+	+		+
Liparis Loeselii (L.) Richard	+	+	+	+	+	+
Listera auriculata Wiegand	+	+	+			
Listera australis Lindl.			+			
Listera convallarioides (Sw.) Nutt.	+	+	+			
Listera cordata (L.) R. Br.	+	+	+	+	+	
Malaxis brachypoda (Gray) Fern.	+	+	+	+		+
Malaxis unifolia Michx.	+	+	+	+	+	+
Orchis rotundifolia Banks	+		+			
Orchis spectabilis L.	+	+	+	+	–	+
Pogonia ophioglossoides (L.) Ker.	+	+	+	+	+	+
Pogonia ophioglossoides f. albiflora Rand & Red.				–		
Spiranthes cernua (L.) Richard	+	+	+	+	+	+
Spiranthes cernua var. ochroleuca (Rydb.) Ames	+	+	–	+		+
Spiranthes gracilis (Bigel.) Beck	+	+		+	+	+
Spiranthes lacera Raf.	+	+	+	+	+	
Spiranthes lacera x Romanzoffiana	+					
Spiranthes lucida (H. H. Eaton) Ames	+	+	+	+		+
Spiranthes Romanzoffiana Cham.	+	+	+	+		+
Spiranthes tuberosa Raf. var. Grayi (Ames) Fern.	+	+		+	+	+
Spiranthes vernalis Engelm. & Gray		+		+	+	+
Tipularia discolor (Pursh) Nutt.			–	+		+
Triphora trianthophora (Sw.) Rydb.	–	+	+			+

Two species which might have been included in the above list have very dubious claims to a place in the New England Flora. *Sisyrinchium albidum* was found once on Drake's Island, Wells, in York County, Maine. Its natural range is much farther to the west and its inclusion in our floral area is extremely doubtful. The report of *Gymnadenia conopsea*, a European orchid, at Litchfield, Connecticut, is authenticated by a specimen collected by Miss Anna M. Vail and now in the herbarium of the Torrey Botanical Club. This collection, the only one known from North America, is cited in "Additions to the Flora of Connecticut," Bulletin 48, State Geological and Natural History Survey, 1930. No one has ever been able to relocate the station.

In the list of plants which are discussed in this article the nomenclature of the Eighth Edition of Gray's Manual has been followed and so no references to Rhodora or other botanical literature has seemed necessary,

One of the introduced species listed is, strangely enough, an orchid, *Epipactis Helleborine*. Williams did not include it in his 1902 list but commented on its introduction at Stockbridge, Mass. where "it was hardly likely to persist, as it selected a hedge along the main street for a habitat." It has, however, persisted and now we have seen specimens from three states and reliable records from a fourth. In 1948 another station was reported at Stockbridge and a new one at Coventry, Conn.

An introduced species which is familiar to everyone is *Hemerocallis fulva*. It originated in China and does not set seed. All the thousands of plants growing all over the country are the progeny of a single individual. It is an example of the efficiency of vegetative multiplication.

Geographically the species here considered fall into groups which have already been used and defined in previous reports. Varieties and forms which seem to have no geographic significance in our area are omitted as usual.

I. generally distributed.—*Acorus Calamus, Eriocaulon septangulare, Pontederia cordata, Maianthemum canadense, Medeola virginica, Trillium cernuum, Uvularia sessilifolia, Iris versicolor, Sisyrinchium montanum* var. *crebrum, Arethusa bulbosa, Calopogon pulchellus, Corallorhiza maculata, Cypripedium acaule, Habenaria fimbriata, Liparis Loeselii, Malaxis unifolia, Pogonia ophioglossoides.*

While the above species are widely distributed, this does not mean that they occur in the same relative abundance. For example, *Iris versicolor* occurs in masses, but *Arethusa bulbosa*, if you reach the proper habitat, will yield comparatively few individuals. *Acorus Calamus* and *Pontederia cordata* are not found in northern Maine though otherwise are generally distributed. *Trillium cernuum* is not represented from the outer towns on the tip of Cape Cod nor on Martha's Vineyard or Nantucket. There are several of the orchids which are not found in the outer townships of Cape Cod—*Arethusa bulbosa*, *Corallorhiza maculata*, *Habenaria fimbriata* and *Malaxis unifolia*. This is probably due to the lack of a suitable habitat.

II. RATHER GENERAL EXCEPT NORTHERN MAINE AND WASHINGTON COUNTY COAST.—*Arisaema atrorubens*, *A. Stewardsonii*, *Symplocarpus foetidus*, *Lemna minor*, *Spirodela polyrhiza*, *Lilium philadelphicum*, *Polygonatum pubescens*, *Sisyrinchium angustifolium*, *Goodyera pubescens*, *Habenaria lacera*, *Spiranthes cernua*.

Arisaema atrorubens and *A. Stewardsonii* do not reach Nantucket. *Spirodela polyrhiza* and *Goodyera pubescens* are not found on either Martha's Vineyard or Nantucket, nor do they occur in the outer townships of Cape Cod. *Symplocarpus foetidus* has a rather thin representation in the northern part of its range.

III. RATHER GENERAL EXCEPT IN SOUTHEASTERN MASSACHUSETTS AND WASHINGTON COUNTY COAST.—*Allium tricoccum*, *Erythronium americanum*, *Veratrum viride*, *Cypripedium Calceolus* var. *parviflorum* and var. *pubescens*, *C. reginae*, *Habenaria flava* var. *herbiola*, *H. Hookeri*, *H. hyperborea*, *H. viridis* var. *bracteata*, *Orchis spectabilis*.

Some of these species are definitely infrequent in northern Maine. Aroostook County is represented by only two specimens of *Erythronium americanum* and by only one each of *Allium tricoccum* and *Habenaria flava* var. *herbiola; Orchis spectabilis* has only one station north of 45° in Maine.

IV. RATHER GENERAL EXCEPT SOUTHEASTERN MASSACHUSETTS.—*Calla palustris*, *Clintonia borealis*, *Lilium canadense*, *Smilacina trifolia*, *Streptopus roseus* var. *perspectus*, *Trillium erectum*, *T. undulatum*, *Corallorhiza trifida*.

V. RATHER GENERAL EXCEPT THE WASHINGTON COUNTY COAST.—*Smilacina racemosa*, *S. stellata*, *Smilax herbacea*, *Habenaria blephariglottis*, *H. psycodes*.

Smilacina stellata, except for extreme northern Maine, seems to be lacking in most of the eastern part of the state. *Habenaria blephariglottis* is absent from western Vermont and largely from western Massachusetts and is also absent on the coast east of Casco Bay. *Habenaria psycodes* is not found in the lower Cape Cod area nor on Nantucket.

VI. NORTHERN, WITH NUMEROUS STATIONS SOUTH OF 43°.—*Goodyera repens* var. *ophioides, G. tesselata, Habenaria clavellata* var. *ophioglossoides, H. dilatata, H. macrophylla, H. orbiculata, Spiranthes lacera.*

Habenaria clavellata was recently divided by Prof. Fernald (RHODORA xlviii. 161) and he points out that the typical plant with long petiolate leaves is definitely southern with outlying stations, many of them transitional, in central New Hampshire, along the Maine coast and at Houlton, Ft. Fairfield, and Ft. Kent. The variety *ophioglossoides* with short broad leaves is definitely northern with outposts as far south as Cape Cod and Providence. In like manner the material passing as *Spiranthes gracilis* was recently shown by Prof. Fernald to fall into two distinct species, *S. gracilis* and *S. lacera* (RHODORA xlviii. 5). Although *S. lacera* is the northern segregate, it is entirely absent in northern Maine.

VII. NORTHERN, NOT MUCH SOUTH OF 43°.—*Allium Schoenoprasum* var. *sibiricum, Streptopus amplexifolius* var. *americanus, Tofieldia glutinosa, Calypso bulbosa, Cypripedium arietinum, Goodyera oblongifolia, Habenaria obtusata, Listera auriculata, L. cordata, L. convallarioides, Malaxis brachypoda, Orchis rotundifolia, Spiranthes Romanzoffiana.*

Orchis rotundifolia definitely belongs in this group, but there are very few specimens upon which to base such a classification. These comprise four from Maine and five from Vermont. *Goodyera oblongifolia* occurs in extreme northern Aroostock County, Maine and there are two records from Vermont. *Streptopus amplexifolius* var. *americanus, Malaxis brachypoda* and *Spiranthes Romanzoffiana*, unlike the other species in this group, have a few stations in western Massachusetts and Connecticut.

VIII. CHIEFLY THE THREE SOUTHERN STATES.—*Peltandra virginica, Lemna perpusilla, Xyris caroliniana, Aletris farinosa, Allium canadense, Smilacina racemosa* var. *cylindrata, Smilax rotundifolia, Hypoxis hirsuta, Sisyrinchium atlanticum, Habenaria clavellata.*

Some of these species are found along the Maine coast; *Sisyrinchium atlanticum*, for example, extends as far as Eastport. *Lemna perpusilla* and *Smilacina racemosa* var. *cylindrata*, however, do not appear in Maine at all and *Hypoxis* is represented by only a single record. *Lemna perpusilla* is only represented from Duxbury, Plympton, and Stockbridge, Mass. and Barrington, R. I.

IX. CHIEFLY THE THREE SOUTHERN STATES BUT NOT IN WESTERN MASSACHUSETTS.—*Arisaema triphyllum, A. triphyllum* f. *pusillum, Orontium aquaticum, Lemna valdiviana, Xyris torta, Habenaria ciliaris, H. cristata, Spiranthes gracilis, S. tuberosa* var. *Grayi.*

The only record of *Habenaria cristata*, a species of more southern distribution, is from South Dartmouth, Mass., where it has not been found in recent years. It is very questionably included in our flora.

X. CHIEFLY THE THREE SOUTHERN STATES BUT NOT ON CAPE COD.—*Polygonatum canaliculatum, Uvularia perfoliata, Corallorhiza odontorhiza, Isotria medeoloides, I. verticillata, Triphora trianthophora.*

XI. CHIEFLY THE THREE SOUTHERN STATES BUT NEITHER CAPE COD NOR IN WESTERN MASSACHUSETTS.—*Dioscorea villosa, Spiranthes vernalis.*

There is only one station for *Dioscorea villosa* in Massachusetts.

XII. COASTAL PLAIN.—*Xyris Congdoni, Lilium superbum, Smilax Bona-nox* var. *hederaefolia, S. glauca* var. *leurophylla, Lachnanthes tinctoria, Iris prismatica, Sisyrinchium arenicola.*

Judging from the distribution of their stations *Smilax Bona-nox* var. *hederaefolia, Lachnanthes tinctoria* and *Sisyrinchium arenicola* are true coastal plain plants, though *Lachnanthes tinctoria* does not occur on either Martha's Vineyard or Nantucket and the only occurrence of *Smilax Bona-nox* var. *hederaefolia* is on Nantucket. The other species extend inland to some extent and are more coastal than coastal plain in nature.

XIII. WESTERN NEW ENGLAND ONLY.—*Arisaema Dracontium, Chamaelirium luteum, Trillium grandiflorum, Uvularia grandiflora, Aplectrum hyemale, Liparis liliifolia.*

While there is a station for *Trillium grandiflorum* in Maine and one in New Hampshire, the species otherwise in the New England area is decidedly western. *Chamaelirium luteum* is confined to western Connecticut and southwestern Massachu-

setts. *Liparis liliifolia* seems to belong here but it also has stations in the eastern Massachusetts rich woods area.

XIV. MARITIME WITH NO INLAND STATIONS.—*Iris Hookeri.*

This species is the only representative of this group and in New England it is confined to the Maine coast east of the Penobscot River.

XV. ESTUARINE.—*Eriocaulon Parkeri.*

XVI. INTRODUCED SPECIES.—*Commelina communis, C. diffusa, C. virginica, Tradescantia ohioensis, T. subaspera, T. virginiana, Allium fistulosum, A. oleraceum, A. vineale, Asparagus officinalis, Colchicum autumnale, Convallaria majalis, Hemerocallis flava, H. fulva, Hosta japonica, H. ventricosa, Lilium tigrinum, Muscari botryoides, M. racemosum, Polygonatum latifolium, Scilla sibirica, Yucca Smalliana, Leucojum aestivum, Narcissus poeticus, N. Pseudo-Narcissus, Belamcanda chinensis, Crocus vernus, Iris germanica, I. laevigata, I. orientalis, I. pumila, I. Pseudacorus, Epipactis Helleborine.*

Many of these introduced species merely persist without showing much evidence of becoming aggressive though *Allium vineale*, occurring only in southern New England, has become a bad weed in some places.

XVII. MISCELLANEOUS.—*Lemna trisulca, Xyris montana, Heteranthera dubia, H. reniformis, Melanthium latifolium, Polygonatum biflorum, Streptopus amplexifolius* var. *oreopolos, Sisyrinchium mucronatum, Habenaria Andrewsii, H. clavellata, Spiranthes lucida.*

Lemna trisulca might be classified as chiefly in the three southern states, but it occurs up the Champlain Valley, at the mouth of the Penobscot River and there is one station in Aroostook County. *Xyris montana*, while it has one station in Aroostook County, is otherwise all south of 45°. *Heteranthera dubia* and *Sisyrinchium mucronatum* occur for the most part in Connecticut and southwestern Massachusetts, but with outlying stations in the Penobscot Valley in Maine and also in the Champlain Valley. *Heteranthera reniformis, Melanthium hybridum* and *Polygonatum biflorum* are found only in southwestern Connecticut with too few stations to be classified definitely in New England. *Streptopus amplexifolius* var. *oreopolus* in New England occurs only on Mt. Washington and Mt. Katahdin. *Habenaria clavellata* is distinctly southern but it occurs in all the New England states and does not fit into any of the above groups. x *H.*

Andrewsii is found occasionally with its parents. *Spiranthes lucida,* a southern species, extends northward throughout Vermont and as far east as central Maine. It is not found in Rhode Island nor west of the Connecticut River in Massachusetts.

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PENTHORUM: ITS CHROMOSOMES

J. T. BALDWIN, JR. AND BERNICE M. SPEESE

PENTHORUM L. is of widespread occurrence in North America and Asia and is variously interpreted to consist of one, two, or three species. The genus is found, as *P. sedoides* L., from New Brunswick to Texas, from Ontario and Minnesota to Florida. It grows in wet low places and exhibits the extreme vegetative variability often expressed by plants subjected to periodic inundations. Representatives of the genus in Asia are frequently referred to this same species.

The affinities of *Penthorum* are puzzling. The genus has sometimes been placed in the *Crassulaceae;* for example: De Candolle (1828) established Tribe *Crassulaceae Anomalae* for *Diamorpha* Nutt. and *Penthorum;* Torrey and Gray (1840) put these genera together in Tribe *Diamorpheae;* Schönland (1894) incorporated *Penthorum* between *Diamorpha* and *Triactina* Hook. f. & Th. But Berger (1930) omitted *Penthorum* from his monograph on the *Crassulaceae,* and Fernald (1950) broke with the practice in the previous editions of *Gray's Manual* by assigning this genus to the *Saxifragaceae* rather than to the *Crassulaceae.* This accords with the work of certain other investigators. Baillon (1872) referred *Penthorum* to a monotypic tribe, and Engler (1930) to a monotypic subfamily, of the *Saxifragaceae.* On the basis of morphological and anatomical data, van Tieghem (1899) erected the *Penthoraceae* as a family for the genus, and Rydberg (1932) and Small (1933) followed van Tieghem's treatment.

In the course of embryological studies of American and Asiatic plants of *Penthorum sedoides,* Rocén (1928) counted eight prophase chromosomes in embryo-sac and pollen-mother-cell divi-

sions. Mauritzon (1933) interpreted embryological observations to mean that the genus showed closer relationship to the *Saxifragaceae* than to the *Crassulaceae;* Skovsted (1934), relying on chromosome numbers then known for the two families, was of the opposite view. Baldwin (1940) reported *n*-numbers of 9 and 2*n*-numbers of 18 for *P. sedoides* from Virginia and for *Diamorpha cymosa* (Nutt.) Britt. from Alabama, Georgia, and North Carolina (and later found these numbers for *D. cymosa* near Rugby, Morgan Co., Tennessee). These and other chromosomal data suggested that *Penthorum* rightly belonged in the *Crassulaceae.*

Subsequent study has confirmed these observations on the chromosomes of American representatives of *Penthorum sedoides.* Prof. Chien P'ei, Institute of Botany, Academia Sinica, Shanghai, and Prof. Albert N. Steward, Department of Botany, University of Nanking, Nanking, each sent us seed identified by them as *Penthorum sedoides.* We found plants from seed of both those sources to have *n*-numbers of 8, 2*n*-numbers of 16. Analysis of material from China thus substantiates Rocén's report. That two different chromosome numbers are present is an indication that the American and Asiatic plants belong to different species. No suggestion is made here as to what family *Penthorum* should be relegated.

Geographic sources, chromosome numbers, and the collectors of American plants of *P. sedoides* investigated by us are listed:

New York	*n*	*2n*	
Tioga Co.: Flemingsville		18	R. T. Clausen
Indiana			
Wells Co.: Bluffton		18	C. C. Deam
Arkansas			
Washington Co.: Springdale		18	D. M. Moore
Virginia			
James City Co.: Five Forks	9		R. W. Menzel
Williamsburg	9	18	B. M. Speese
Clarke Co.: Boyce	9	18	J. T. Baldwin, Jr.
Shenandoah Co.: Fort Valley		18	J. T. Baldwin, Jr.
Strasburg		18	J. T. Baldwin, Jr.
Amelia Co.: Amelia Courthouse		18	J. B. Lewis.

As records of some of the plants for which chromosomes were investigated, the following specimens have been placed in the Herbarium of the U. S. National Arboretum, Beltsville, Mary-

land: *Baldwin 5351*, Shenandoah Co., Virginia; *Baldwin 14537*, James City Co., Virginia; and *Baldwin 14538*, plant from seed sent by Professor Steward from Nanking, China.

Literature Cited

Baillon, H. 1872. Histoire des Plantes. vol. **3**. Paris.

Baldwin, J. T., Jr. 1940. Cytophyletic Analysis of Certain Annual and Biennial Crassulaceae. Madroño **5**: 184–192.

Berger, A. 1930. Crassulaceae. Die Natürlichen Pflanzenfamilien **18a**: 352–483.

De Candolle, A. P. 1828. Prodromus. vol. **3**. Paris.

Engler, A. 1930. Saxifragaceae. Die Natürlichen Pflanzenfamilien **18a**: 74–226.

Fernald, M. L. 1950. Gray's Manual of Botany. New York.

Mauritzon, J. 1933. Studien über die Embryologie der Familien Crassulaceae und Saxifragaceae. Lund.

Rocén, T. 1928. Beitrag zur Embryologie der Crassulaceen. Svensk Bot. Tidskr. **22**: 368–376.

Rydberg, P. A. 1932. Flora of the Prairies and Plains of Central North America. New York.

Schönland, S. 1894. Crassulaceae. Die Natürlichen Pflanzenfamilien **3**: 23–38.

Small, J. K. 1933. Manual of the Southeastern Flora. New York.

Skovsted, A. 1934. Cytological Studies in the Tribe Saxifrageae. Dansk Bot. Arkiv. **8**: 1–52.

Torrey, J. and Asa Gray. 1840. Flora of North America. New York.

van Tieghem, P. 1899. Sur le genre Penthore considéré comme type d'une famille nouvelle les Penthoracées. Ann. Sci. Nat. Bot. (Sér. 8) **9**: 371–376.

College of William and Mary, Williamsburg, Virginia.

RANGE EXTENSIONS OF MARSH AND AQUATIC PLANTS. 2.

Neil Hotchkiss

In the ten years since the author published "Range Extensions of Marsh and Aquatic Plants" (Rhodora 42: 20–22, January, 1940), biologists of the Fish and Wildlife Service, United States Department of the Interior (successor to Bureau of Biological Survey, Department of Agriculture) have made additional discoveries that seem worth recording. A specimen of each collection cited has been deposited in the United States National Herbarium and duplicates of some are in the Gray Herbarium. Identifications are by the writer, except as otherwise noted.

Carex distans L. Determined by E. Nelmes, Royal Botanic Gardens, Kew, courtesy of F. J. Hermann of the United States Department of Agriculture. Common in a damp meadow at the edge of a marsh near the north end of the Potomac River bridge, Morgantown, Charles County, Maryland, June 24, 1948, *N. Hotchkiss and F. M. Uhler No. 7218.*

This appears to be the first North American record for this widespread European species.

Carex extensa Good. Determined by E. Nelmes, Royal Botanic Gardens, Kew, courtesy of F. J. Hermann of the United States Department of Agriculture. Brackish marsh at Dames Quarter, Somerset County, Maryland, July 3, 1948, *F. M. Uhler.*

The eighth edition of Gray's Manual (page 368) gives the habitat and range of this species as "Coastal sands, local, L. I. and Coney I., N. Y.; Norfolk Co., Va."

Wolffia papulifera C. H. Thompson. Drowned-woods pond on Charles Branch, near Croom Station, Prince George's County, Maryland, September 6, 1947, *N. Hotchkiss No. 7184;* drowned-woods pond one mile northwest of Port Richmond, King William County, Virginia, June 25, 1948, *N. Hotchkiss and F. M. Uhler No. 7220;* marshy pond in Pitcherdam Creek, two miles north-northeast of Seward, Dorchester County, Maryland, September 30, 1949, *N. Hotchkiss No. 7284;* and pond along state highway 416 at Lyons Creek, Calvert County, Maryland, October 1, 1949, *N. Hotchkiss No. 7286.*

The eighth edition of Gray's Manual (page 387) gives the range of this species as "Local, Va. to Ill., Ky., Mo. and Kans. (Mex.)." In a letter to the author dated July 14, 1948, M. L. Fernald cited one Virginia locality (Courtland, Southampton County, *Leslie Hubricht No. B2862*). Recently, Don L. Jacobs reported *W. papulifera* from Columbia County, Florida (The American Midland Naturalist 42: 110–111. July 1949).

Aneilema Keisak Hassk. In an earlier article (Rhodora 42: 21), *N. Hotchkiss and C. Cottam No. 4776* from Georgetown County, South Carolina was mistakenly reported as *Aneilema nudiflorum* (L.) Kunth. This collection is *A. Keisak.* Other collections are as follows: Marsh meadow, Cat Point Creek, Richmond County, Virginia, September 4, 1947, *N. Hotchkiss and F. M. Uhler No. 7179;* tidal marsh, Rappahannock River at Port Conway, King George County, Virginia, September 4, 1947, *N. Hotchkiss and F. M. Uhler No. 7181;* cattail-alligatorweed marsh, Smith Creek, Wilmington, New Hanover County, North Carolina, August 12, 1948, *N. Hotchkiss No. 7229;* old ricefield marsh on the east side of the Waccamaw River along U. S. highway 17, Georgetown County, South Carolina, August 13, 1948, *N. Hotchkiss No. 7232;* old ricefield marsh on Black River along U. S. highway 701, Georgetown County, South Carolina, August 13, 1948, *N. Hotchkiss No. 7236;* with alligatorweed in a slough on the Savannah River flood plain along U. S. highway 17, Jasper County, South Carolina, August 15, 1948, *N. Hotchkiss No. 7238;* old ricefield marsh on the Altamaha River along U. S. highway 17, McIntosh County, Georgia, September 2, 1948, *N. Hotchkiss No. 7267;* marsh draining

into Horseshoe Creek on state highway 32 northeast of Ashepoo, Colleton County, South Carolina, September 2, 1948, *N. Hotchkiss No. 7270;* Big Hunting Creek, Fairfax County, Virginia, September 10, 1949, *F. M. Uhler.*

The eighth edition of Gray's Manual (page 393) gives the habitat and range of this species as "Fresh tidal marshes and shores, se. Va." In RHODORA 42: 441, M. L. Fernald cites collections from six Virginia counties. Fernald's discussion in RHODORA 42: 511–513 led to the corrected identification of the Georgetown County, South Carolina specimen and stimulated the search for stations south of Virginia. *A. Keisak* is now known from nine counties in Virginia, one in North Carolina, three in South Carolina, and one in Georgia. The stations are all within the influence of tide on the Potomac, Rappahannock, Mattaponi, Pamunkey, James, Blackwater, Cape Fear, Waccamaw, Black, Santee, Ashepoo, Savannah, and Altamaha Rivers.

MYRIOPHYLLUM VERTICILLATUM L. Stikine Flats, southeastern Alaska, July 30, 1942, *L. J. Palmer No. 720.*

Neither Eric Hultén's "Flora of Alaska and Yukon. VII" (pages 1158–1160. 1947) nor J. P. Anderson's "Flora of Alaska and Adjacent Parts of Canada. Part VII. Geraniaceae to Plumbaginaceae" (Iowa State College Journal of Science 23: 149. January 1949) record this species.

U. S. FISH AND WILDLIFE SERVICE, LAUREL, MD.

TUSSILAGO FARFARA IN MARYLAND.—The Eurasian coltsfoot, *Tussilago farfara* L., which is well established in clayey soils from Newfoundland to Minnesota, extending south to New Jersey, Pennsylvania and Ohio, has apparently never been reported from Maryland. On 25 Sept. 1938 I found two small clumps close together at the base of the Calvert Cliffs along Chesapeake Bay about half a mile above the wharf at Governor Run (now known as Kenwood Beach), Calvert County, Maryland. The following spring (on 5 March), I found 4 flowering stems on the clayey slope of the cliffs about half a mile below the wharf in the same region. The plant has persisted in both places. In the autumn of 1949 I counted about 40 clumps of it at the downstream locality, and in the autumn of 1950 about 16 plants at the upper one. They grow mainly on the clayey-sandy talus at

the foot of the cliffs, a habitat exposed to constant disturbance or destruction by the frequent high tides of the area. The original source of the introduction here is not evident. I have never seen it cultivated in this region.—S. F. Blake, Division of Plant Exploration and Introduction, Plant Industry Station, Beltsville, Maryland.

The Cacti of Arizona[1]—This, the second edition, is a small book with a stiff binding, differing in that respect from the thin flexible-covered first edition which appeared in 1940 as University of Arizona Bulletin, Biological Science Bulletin No. 5. The page size is approximately the same in the two editions and many of the same illustrations are used, but the type and format of the second edition marks a considerable improvement over the first. Also, one sees improvements in the handling of certain plates such as No. X of edition 1 now altered to produce Plates VI and VII of the new edition with less reduction of the photographs; and Plate XXII similarly changed to become Plate XVII with the elimination of one of the photographs. Several colored plates of paintings by Lucretia Breazeale Hamilton are not included in the second edition, but a new colored Plate (XXI), showing the saguaro and organ pipe cacti in their natural settings and including a bit of vivid Arizona sky, is a welcome addition. The maps showing the distribution of various species of cacti in Arizona are reproduced in black in this edition. In the earlier one, the actual range of each species was shown in green. I do not see that the new maps are an improvement, but they were undoubtedly cheaper and less subject to error in reproduction.

The fact that a second edition of this work was called for is a high recommendation of it. This is particularly true when one considers the fact that the book treats but a single family of plants in a relatively restricted geographic area. Counteracting this narrowness of scope to some extent is the wide popular interest in cacti, but one of the most important factors governing the large demand was Dr. Benson's inclusion of general well-illustrated material on the morphology of the cactus flower, notes on how to identify cacti and how to grow them. The new edition continues these features.

There are some changes in the classification of the Cacti in the second edition. These in general appear to represent more matured judgements of taxonomic relationships on the part of Dr. Benson, resulting from a consideration of more adequate material and a longer period of study on the problems involved. The trend in the second edition is toward the recognition of fewer species and the inclusion of some of the taxons formerly treated as species in varietal status. In *Opuntia* there are 32 species in edition 1 and 26 in edition 2. The greatest reduction was in *Echinocereus* from 10 to 5 species. Other genera were handled about the same in the two editions. The omission of an index, which to my mind is a must in a book of this sort, might be rectified if another edition is required.—R. C. Rollins.

[1] The Cacti of Arizona, by Lyman Benson. XIII + 135 pp. with XXIX plates and 33 figures. $4.00. The University of Arizona Press, Tucson. Published at the University of New Mexico Press, Albuquerque. 1950.

Some Irish Naturalists[1]—From the age of six when his grandfather, Robert Patterson, first showed him the Adder's-tongue, *Ophioglossum*, Robert Lloyd Praeger has continued an absorbing interest in natural history, particularly in botany and zoology. Now in his eighty-sixth year he has brought together an album of some 320 Irish naturalists, dating from the seventh century. Praeger himself has "met and known every outstanding naturalist working in Ireland; whether on rocks, animals, plants, insects, fishes or other branches of [natural history]." He became a member of the Belfast Naturalists' Field Club at the age of eleven, and a judge of fern exhibits at the Temple Show at seventeen. After a youth spent in and near Belfast, he went to Dublin in 1893 and remained with the National Library until his retirement in 1923. In 1901 he published *Irish Topographical Botany* and later *The Botanist in Ireland.* He edited the *Irish Naturalist* from its beginning in 1892 throughout its thirty-three years of existence. But it is for his monographic work on the genera *Sedum* and *Sempervivum* that Praeger is best known in America.

Some Irish Naturalists consists of three chief parts, viz., "Some Personal Contacts," telling of Praeger's more intimate scientific associations; "Brief Biographical Notices," a roster making up the bulk of the book; and "Societies, Institutions, Team-work," a summary of the activities of twenty-four organizations, field surveys, and the like. Among the accounts of dozens of botanists in the roster may be found brief notes on Thomas Antisell, C. C. Babington, John Ball, R. M. Barrington, Nathanial Colgan, Thomas Coulter, R. O. Cunningham, H. H. Dixon, G. C. Druce, Thomas Drummond, John Ellis,—to cull from the first five letters of the alphabet only! It is patent, then, that Praeger's book is a highly useful reference work. It is furthermore a delight to browse leisurely through its pages.

We lift one anecdote from Praeger's book for this review: Rev. William Spotswood Green, 1847–1919, aside from serving as rector of a "quiet country parish" and being an invertebrate zoologist of note, was the first to attain the summit of the highest of the New Zealand Alps, Mount Cook, ele. 12,349 feet, in 1881. Later Green surveyed for the Canadian Government in the Rockies of British Columbia and wrote *Among the Selkirk Glaciers* (1890). Praeger says "he was a man for whose energy, enterprise, courage and scientific imagination I had a sincere admiration; and I saw him at his best, at sea under difficult circumstances, during oceanic dredging and attempts to land on tempestuous Rockall. He was resourceful, and daring almost to rashness, as witness his adventures on Mount Cook in New Zealand; and his whimsical humour never forsook him. I recall him staggering down the companion ladder of the little 'Flying Falcon' in a full gale, and surveying the dishevelled cabin and his deep-sea dredging colleagues in a state of collapse. A sudden storm had come up; Green had spent the night with the captain on the bridge, in great pain on account of a heavy fall; and now, surveying the scene in the grey dawn, his only comment was: 'I have always thought that if the hippopotamus had been shown his photograph before he was created, he would have been able to suggest some important improvements.' That was Green all over."—Joseph Ewan, Tulane University.

[1] *Some Irish Naturalists. A Biographical Note-book.* By R. Lloyd Praeger, D.Sc., Sc.D., M.R.I.A. with 60 portraits. Dundalk, W. Tempest, Dundalgan Press, pp. 208. *18 plates, frontispiece.* 1949. 15s.

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ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
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} Associate Editors

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THE NEW ENGLAND BOTANICAL CLUB A HALF-CENTURY AGO AND LATER

Arthur Stanley Pease[1]

Even such a palaeozoic as I do not, from my own experience, recall the founding of this club, but from a brief historical sketch in *Rhodora*[2] by Emile F. Williams I learn that when W. H. Manning had called together a group of local botanists for consultation about a flora of the Metropolitan Parks, all were surprised and shocked to find how unacquainted with one another most of them were. Accordingly, at a later meeting, on December 10, 1895, at the house of Professor W. G. Farlow in Cambridge (now the headquarters of the Harvard Graduate School of Arts and Sciences), the present organization was formed, with Farlow as the first president, the purpose being, as stated in the by-laws, "the promotion of social intercourse and the dissemination [an appropriate botanical metaphor] of local and general information among gentlemen interested in the flora of New England." The term "gentlemen" was intended to emphasize (1) the distinctly staminate character of the group, which was to be no afternoon gathering associated with tea-cups and lumps of sugar, and (2) a certain standard of presentability and behavior.[3]

[1] Rewritten from remarks at the five hundredth meeting of the club, February 2, 1951.

[2] *Rhod.* 1 (1899), 37–39.

[3] Years later seven botanists arrived late one evening, hungry, tired, and shabby, from a long-delayed train, at the chief hotel in Halifax, N. S., where the leader, Fernald, had wired for accommodations for the party. Finding that we were to be crowded into a small space, two in a bed, Fernald vigorously protested that he had telegraphed for rooms for seven *gentlemen*. "Gentlemen don't sleep two in a bed; mill hands do, but not gentlemen." Though the rest of us were so tired that we would have slept *seven* in a bed, he maintained his point, and we were each given a room.

Williams remarks:[4] "It speaks well for the cultivation of the American business class that it contributes to the club almost as many members as the professional botanists themselves, the remainder of the membership comprising teachers, . . . physicians, lawyers, literary men, and men of leisure, but not of idleness, this favored class furnishing some of the most efficient members of the club."

At first the meetings were held in the houses of members, but attendance so increased that by 1896 the club moved to the St. Botolph Club on Commonwealth Avenue (where I first knew it), in 1903 to the Hotel Brunswick, in 1906 to the Twentieth Century Club on Joy St., and in 1923 to the house of the American Academy of Arts and Sciences.

As an undergraduate I had been a member of the old Harvard Natural History Society, where I had known C. H. Knowlton, LeRoy Andrews, J. M. Hunnewell, and M. L. Fernald, the last named being still an assistant in the Gray Herbarium. I had also subscribed to *Rhodora*, in the third volume of which (July, 1901) Walter Deane described a white-fruited *Gaylussacia*. That same month there was brought to my notice a white-fruited high-bush blueberry bush in a pasture a mile from my house in Andover, Mass., and I was so bold as to send specimens of it to Mr. Deane, who speedily published it in *Rhodora*[5] as a new form, *Vaccinium corymbosum* L., var. *atrococcum* Gray, f. *leucococcum*[6] Deane. Further, when Deane learned that I was a college student on my vacation he invited me to come to see him in Cambridge in the fall, and, after closer acquaintance, took me as his guest on May 2, 1902, to the Club meeting at the St. Botolph Club, at which Dr. R. G. Leavitt of the Ames Laboratory spoke (morphologically) on *Drosera* and Professor B. L. Robinson—always known as "Dr. Robinson"—discussed (taxonomically) the genus *Hypericum*. In December, 1902, I was elected a member of the Club—an indirect result, it would seem, of the abnormal pigmentation of a few blueberries!

The Club has been very conservative in its ritual[7] as well as in its membership, so that the early meetings in this century in

[4] *L. c.*

[5] *Rhod.* 3 (Nov., 1901), 265.

[6] Not, as *Gray's Manual*, 8th edition, states, f. *leucocarpum*.

[7] Among conservative touches is the appointment, at elections of officers or members, of "scrutineers" rather than anything so commonplace as "tellers."

many respects resembled those of the present day: an irregular and straggling assembling for conversation and exchange of specimens between 7:30 and 8:00 p. m., during which time some members would probably try to secure the identification of puzzling specimens from Messrs. Robinson, Fernald, or—for the fungi—Hollis Webster. The call to order came about 8:00, with the President seated at the table in front, flanked, as now, by the Recording Secretary at his left and the Corresponding Secretary at his right, the Vice-President and the Treasurer having never been so featured. After the formal papers and various short and impromptu notes from the floor there followed an ample collation. A long table, loaded with viands, such as chicken croquettes, cold joints, salads, escalloped oysters, and ice-cream, was replenished by one or two bustling waiters. Where Emile F. Williams was, there one was sure of something worth eating! Austerity came with his demise and with the economies of the First World War.

Sketches of the chief officers and of one or two prominent members may make clearer the picture of the Club as a whole, and I shall start with those at the head table.

The President, Professor Roland Thaxter, was the son of Celia Thaxter, the writer and poetess of the Isles of Shoals, though he himself was more firmly rooted on the mainland at Kittery, Maine, where he had a summer cottage with a lawn upon which seemed to grow specimens of all the supposedly rare cryptogams which enthusiastic and ambitious students brought in to him from all sources for his approbation. He was a serious, brown-bearded man,[8] with a cool New England reticence and a cautious understatement which effectively deflated any overexuberant enthusiasms of the inexperienced. From friends of mine who were his pupils I gathered details which increased the natural awe in which one would regard so august a personage.

(Digression on the common house-fly.) This aggressive and pertinacious animal (the existence of which has, from antiquity, constituted one of the greatest obstacles to belief in a beneficent divine providence) in late summer loses its *élan vital*, and clings feebly to walls and ceilings, not, as I am told, because of cold

[8] Many members then wore beards or side-whiskers; one of the last, if not the very last, disappeared with the death of Merritt Fernald.

weather, but from the growth upon its shins of a vegetable parasite of the genus *Laboulbenia*. In our present sadly commercialized age we might try to raise, by selection, hybridization, or by some bonus, incentive, or retiring allowance, a bigger, better, busier *Laboulbenia*, and to get her more promptly on the job. But Roland Thaxter was reputed to have said that if any problem upon which he was engaged proved susceptible of any economic application he should immediately lose all interest in it. Nature, then, had to take its course, while this greatest Laboulbeniaceologist of the Charles River basin, if not of Eastern Massachusetts, kept his escutcheon untarnished—save by fly-specks. So Aristotle says:[9] To be always seeking after the useful does not become free and exalted souls." (End of digression on the fly.)

At the President's left, as now, sat the Recording Secretary. In 1902 this functionary was Emile Francis Williams, born in France, and (at that time) a stout, jolly bachelor, a prosperous importer of Oriental rugs, a thoroughly competent epicure, and a devotee of the theatre.[10] His minutes were entertaining to hear, partly from their breezy humor and the gusto with which he read them, and partly from the entanglement of his tongue in the pronunciation of the longer scientific names. As a field collector he prepared beautiful specimens for his large herbarium, and introduced a new method of folding plants too long for an herbarium sheet, by inserting in the pressing papers a thin sheet of metal to hold the recalcitrant leaves and twigs in place during the drying process.[11] While Thaxter intensively scrutinized his lawn at Kittery, Williams made trips, usually with companions, like the Faxon brothers, Judge Churchill, or Fernald, to the White Mountains or to new localities, like Katahdin or Gaspé.[12]

At the President's right sat the Corresponding Secretary, Edward Lothrop Rand—called Ned Rand in distinction from his

[9] *Politics*, 8, 3.

[10] His noteworthy scrapbooks, with programmes of the first performances of every play in Boston worth seeing, were shown me after his death by his widow, who gave them, I believe, to the theatre collection in Widener Library of Harvard University.

[11] Fernald also introduced improvements in technique, including the folding of the bottom over the top instead of the top over the bottom in case of sprawling specimens, such as grasses and sedges. He also devised the use of "salivators" for holding delicate leaves and petals open during drying.

[12] A posthumous article by Fernald in *Rhod.* 53 (1951), 1–6, describes the first expedition of Fernald and Williams to the Gaspé peninsula.

contemporary member Harry Seaton Rand,—a Boston lawyer who lived in a very retired house at Porter Square in North Cambridge, approached through a long garden walk where one seemed to leave behind all the noises of the town. He was a lean, dark-complexioned man, of laconic utterance but abounding and ready wit, both dry and more explosive, with which he liked at times to tease his intimates, especially Walter Deane, upon whom he wrote the classic verses sometimes read at the celebrations of this club, beginning "In the youth of Walter Deane." Rand was a keen and tireless collector in a limited district, who made Mt. Desert Island perhaps the most intensively collected area of its size in New England, and who, assisted by J. H. Redfield and encouraged by President Eliot, published the standard flora of that island.

Appearances are often deceptive, but the membership of the Club, as seen at its meetings, gave the impression of greater age than at present, partly by the prominence of beards and partly because there were fewer graduate students than today, H. H. Bartlett, S. F. Blake, A. H. Moore, and Harold St. John being among the few nearly contemporaneous with myself whom I can now recall. As a result of fewer students there was a larger proportion of permanent members, with many whose regularity in attendance at meetings was conspicuous, an especially notable case being that of J. F. Collins, the bryologist from Brown University—a most helpful and practical companion on field expeditions,—who, despite the weather, never failed to come up from Providence for the monthly meetings. Many of the members had their own herbaria, accounts of some of which may be found in the successive instalments of Miss Mary A. Day's articles on the Herbaria of New England in the third volume of *Rhodora*. There was competition, both quantitative and qualitative, between these different collectors, the largest herbaria, I should say, being those of Deane and Williams, and the finest specimens, in general, being those prepared by Fernald, Williams, R. A. Ware, and (later) C. F. Batchelder. These private herbaria became, in many instances, important feeders for the Gray Herbarium and those of the Club and the Boston Society of Natural History, though some, like that of J. R. Churchill, went farther afield. Some of the members exchanged widely, particu-

larly with other regions in the range of *Gray's Manual*, but Judge Churchill admitted to his herbarium only specimens culled by his own hand.

Many of the members were amateurs, who had taken up botany, sometimes in middle life, as an avocation from their professions in other fields; for example the wealthy and generous banker N. T. Kidder; three judges: J. R. Churchill ("the judge" *par excellence*, botanically speaking, though perhaps their Honors Dodge and Jenny may have outranked him juridically); lawyers like E. L. Rand; physicians like Doctors Kennedy, Webster, and (the elder) Cheever; educators like President Brainerd of Middlebury College, Headmaster W. L. W. Field of Milton Academy, and Hollis Webster of Cambridge; an artist in the person of F. Schuyler Mathews—an important illustrator for the seventh edition of *Gray's Manual;* a country store-keeper, that shrewd and lank Yankee C. H. Bissell, of Southington, Connecticut; and business men like Williams and R. A. Ware. Several were specialists in other scientific areas: J. H. Sears in geology, H. P. Kelsey and W. P. Rich in horticulture—the latter a constant explorer of the flora of the Boston dumps—,William Brewster and Walter Deane in ornithology, J. H. Emerton in spiders, and F. F. Forbes, an official in the Brookline waterworks, who from its ditches collected diatoms. These varied types converged somewhat into the old-fashioned naturalist, men like Gilbert White of Selborne, England, and Henry D. Thoreau of Concord; observers of trees, herbs, birds, rocks, weather, and often of men, who were able to talk (and sometimes to write) so as to interest others in what had interested them. They were still unafraid of experts; men of the field rather than of the laboratory,[13] with the originality of view and picturesqueness often found in those who are free from the taboos of professional etiquette, and with an enthusiasm which has proved a strong motive force in the development of this club.

On the other hand, the Club in the period under discussion was more narrowly concerned than today with the area of New England. The name of its organ, *Rhodora*, was chosen to indicate, in a general way, the geographic range of articles for which

[13] Professor Fernald used to maintain that the laboratory kills most of a student's natural interest in the world around him.

it was designed. This range expanded, however, with the extension of interest of Professor Fernald, to Gaspé, Nova Scotia, Newfoundland, Lake Superior, and, finally, tidewater Virginia. Several of the members had published local floras, e. g., in addition to Rand and Redfield for Mt. Desert, L. L. Dame and F. S. Collins (of the old Middlesex Institute at Malden) for Middlesex County, John Robinson for Essex County, Ralph Hoffman for Berkshire County, C. H. Bissell for Southington, Connecticut, and G. G. Kennedy for Willoughby, Vermont.* Advance studies or additions for these floristic undertakings frequently first appeared in remarks or papers at the Club meetings and later in the pages of *Rhodora*, as well as topical or monographic treatments of particular groups of plants. I well recall F. F. Forbes's beautiful slides of diatoms and President Brainerd's spirited discussions of hybridity in *Viola*, in which he developed the "love-life" of these seemingly innocent plants with almost the breathless thrill of an unfolding detective story. Illustrated talks were in the earlier years fewer than now, but with the exploration of regions unfamiliar to most of the members, and particularly with the excellent photographs taken by Fernald and J. F. Collins in Gaspé and Newfoundland, such became more frequent. Certainly there was much more in the early years of the exhibition of specimens hung up on the nets for discussion and later inspection.

The most influential member of the Club, over a long series of years, was undoubtedly Merritt Fernald, but since his life, personality, and work have been rather fully treated elsewhere I shall not discuss him further in this paper, but out of the remaining members select for brief mention two others as being especially typical.

Walter Deane was the son of a distinguished historian, Charles Deane. After teaching in St. Mark's School he married the daughter of its headmaster, Dr. Coolidge. The Deanes lived in a double house on Brewster St. in Cambridge, connected by an inside door with the Coolidges on the other side of the wall, and after the deaths of Dr. and Mrs. Coolidge the Deane household expanded into both houses, which were crowded to the roof with

*** Professor Pease has modestly omitted reference to his own "Vascular Flora of Coös County, New Hampshire," published in 1924.—Eds.**

books, pictures, and herbarium cases. Deane had the time and a passion for extreme documentation (perhaps an inheritance from his historian-father?), and his pictures were labelled on the back with the names of artists, donors, owners, subjects, and criticisms made by those who had seen them. Hundreds of his herbarium sheets were similarly marked with the visas of Robinson, Fernald, L. H. Bailey, and many others, earlier and later. Ned Rand made somewhat merry over this documentary habit, and once asked me, with a twinkle in his eye, how valuable today I thought that the visa of Dr. Gray on a sheet of *Antennaria* would be. Deane's principal activity was as curator in the private ornithological museum of William Brewster in the Brewster garden across the street from his house. His own herbarium, of perhaps 40,000 sheets, was in part composed of his own collections, chiefly at Whitefield and later at Shelburne, N. H., in part of generous gifts of duplicates from Judge Churchill, and in part from other correspondents. He did much work on it himself and always went into all points in great detail, though usually bowing to the judgment of experts. Active in the Nuttall Ornithological Club and for many years secretary of the Old Cambridge Shakespeare Association, he devoted also to this Club much time and loyal attention. A childless man with a most fatherly manner, he always beamed with geniality and enthusiasm, and he was in his day probably the most generally beloved member of the Club.

Joseph Richmond Churchill, of Meeting House Hill in Dorchester, was for sixty years judge in a municipal court. He was a portly man, with grey sidewhiskers and a calm, unhurried look and manner. He collected in many parts of the *Manual* range, showing considerable initiative in selecting the unusual places to which he went—often with his wife and daughter—,but on an expedition with other men the party was often a good deal delayed because he must get a specimen of each rarity found but must also collect this by plucking it with his own hands, sometimes while boosted up to a ledge on the back of Fernald or some other stalwart companion. I several times collected with him in the field, and remember very clearly a trip in the Blue Hills near Milton, on which we passed a field conspicuously placarded with "No Trespassing" signs. The judge caught sight of a

rather rare weed among the grain, and walked to the fence to view it more closely. He looked at the weed and then at the signs, and then at the weed again, and I could see the external evidences of a severe internal conflict between the judge and the botanist. The botanist won, and he explained to me that he was probably really doing a favor to the landowner by removing this weed before it spread and became a pest.

These are but a few of many memories of the earlier period of the Club, an age not necessarily better or worse than the present, but though in some external details our organization was then much like that of today, yet in other details, of human personalities, the Club stood in considerable contrast at various points. As Tennyson remarks,

> God fulfills himself in many ways,
> Lest one good custom should corrupt the world.

A NEW HEUCHERA FROM MISSOURI TOGETHER WITH SOME NOTES ON THE HEUCHERA PARVIFLORA GROUP

C. O. Rosendahl

A number of years ago Dr. Steyermark sent me a specimen of a *Heuchera* from Wayne County, Missouri which at the time Dr. Butters and I took to be a hybrid of *H. puberula* × *H. americana* var. *hirsuticaulis.* Upon further examination of the material I became convinced that this surmise was wrong for I was unable to find any clear evidence of any admixture of var. *hirsuticaulis* in the assumed cross. Also it was manifest that the plant was closer allied to *H. parviflora* var. *Rugelii* than to the geographically more restricted *H. puberula.* Although it clearly differed from typical *Rugelii* in the densely glandular-villous petioles and stems, in the less open inflorescence with more numerous shorter pedicelled flowers I was nevertheless disposed to regard it only as a somewhat aberrant individual of this wide ranging variety. Later on Dr. Steyermark sent me more material and at the same time called attention to several vegetative and floral characters in which it differed from var. *Rugelii.* He suggested that it might prove to be something new.

With the aid of this material it has been possible to undertake a more thoroughgoing study and clear up the earlier doubt about the proper status of the plant.

Heuchera missouriensis sp. nov. Acaulescens vel subcaulescens e caudice crassa, reliquis petiolorum vetustorum vestita; folia petiolis (5) 8–14 (19) cm. longis dense villosis pilis longis glandulosis pallido-ferruginis vel sordidis; stipulis oblongis adnatis fimbriatis 5–10 mm. longis; laminis 8–12 cm. longis, 10–14 cm. latis orbiculari-reniformis plerumque 7–9 lobatis, lobis crenato-dentatis, dentibus late-obtusis mucronatis vel interdum acutiusculis, superficie superiore plus minusve villosa, inferiore dense villosa praesertim in venis primis; caules floriferi 20–36 cm. alti glanduloso-villosi, bracteis sterilibus nonnullis et interdum 1–2 foliis minoribus instructi, bracteis fertilibus atque sterilibus 3–8 mm. longis, prope basin trifidis consistunt in laminibus mediis angustis plus minusve laciniato-pinnatifidis atque stipulis binis adnatis ovatis vel lanceolatis fimbriatis; paniculae 10–18 cm. longae, angustae multiflorae; cymulis (5) 7–9 (12) floriferis, dichasialis; pedicellis ad 5 mm. longis demum arcuato-recurvatis; flores parvi glanduloso-pubescentes in anthesin 3.5–4.5 mm. longi, calycibus brevibus turbinatis 2–2.5 mm. longis rubro-brunescentibus; sepalis ovatis, obtusis 1–1.2 mm. longis etiamque latis; petalis albis oblanceolatis 1.6 mm. longis, 0.6 mm. latis breve unguiculatis; staminibus 2.5–3 mm. longis; filamentis subclavatis; stylis sensim attenuatis primum subdivergentibus demum divaricatis, ad basin minute-puberulentis; stigmata subcapitata; fructus turbinatus 2.4–3 mm. longus, rostra capsulorum valde divaricata vel recurvata; semina nigra 0.35–0.45 mm. longa leviter verrucoso-striata.

The species is known from two stations in southeastern Missouri, one in Madison County on limestone bluffs along the St. Francis River near the mouth of Captain Creek—*Steyermark* 20980, Nov. 15, 1936; the other in Wayne County at Hall's Bluff, south of Davidson's Blue Spring, also on limestone,—*Steyermark* 6342 (type), Sept. 1, 1938. Two additional collections from the latter station are *Steyermark* 11542, July 9, 1936 and *Steyermark* 66966, Oct. 21, 1948.

As already stated the new species is closely related to *H. parviflora* var. *Rugelii*. It differs from the latter in the more densely glandular-villous pubescence of stems, petioles, and under surface of the leaves, in the narrower inflorescence with more numerous shorter pedicelled flowers (Pl. 1166) with short blunt sepals which are as wide as long (Fig. 4) and in the petals which have a short instead of a relatively long, slender claw (Fig. 5). In var. *Rugelii* as the fruit develops the part of the hypanthium adnate to the ovary enlarges considerably resulting in an ovoid capsule with a rounded base, whereas in *H. missouri-*

Photo by Wilma Monserud

HEUCHERA MISSOURIENSIS ROSENDAHL

ensis there is scarcely any such enlargement so that the capsule remains obconic at the base (Fig. 3). The mature fruit of the former, exclusive of the styles proper, measures 3.5–4.5 mm. in length contrasted with 2.5–3 mm. for the latter. The beaks of

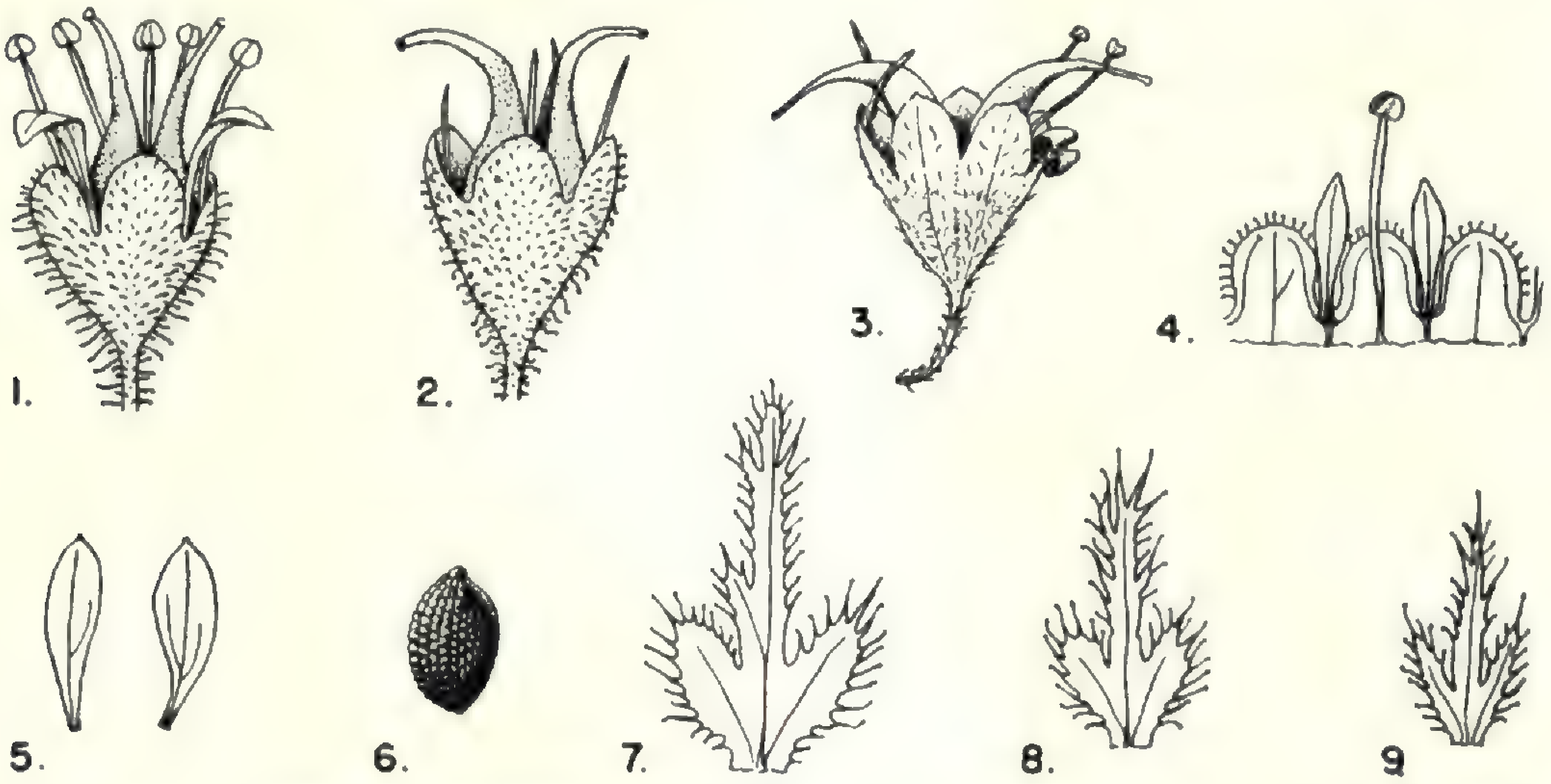

Fig. 1. Flower at anthesis, × 5; Fig. 2. Immature fruit, × 5; Fig. 3. Fully mature fruit, × 5; Fig. 4. Part of dissected flower, × 5; Fig. 5. Petals × 5.5; Fig. 6. Seed × 23; Fig. 7. Bract from below inflorescence, × 3.5; Fig. 8. Bract from base of inflorescence, × 3; Fig. 9. Bract from about middle of inflorescence, × 3.3.

the mature carpels in var. *Rugelii* are for the most part erect or only slightly divergent with the styles directed forward, while in *H. missouriensis* the beaks are widely spreading and the styles usually recurved (Fig. 3). The seeds of *H. parviflora* and its var. *Rugelii* appear smooth (under a magnification of × 20) or at most marked with a few faint irregular ridges, while in the new species the seeds are finely verrucose-striate (Fig. 6).

In our monographic treatment of *Heuchera*[1] we pointed out that *H. parviflora* var. *Rugelii* is much more widely distributed than var. *typica*, occurring from western North Carolina northward into West Virginia, thence westward through Tennessee, Kentucky, southern Indiana to southern Illinois and south into northern Georgia, Alabama and Mississippi. Throughout this wide territory the variety is remarkably uniform as regards inflorescence, flowers and fruit but may vary considerably in the amount of pubescence of stems, petioles and leaf blades. In

[1] Rosendahl, Butters and Lakela, A Monograph of the Genus *Heuchera*. Minnesota Studies in Plant Science 2: 38, 1936.

some collections from southern Illinois, particularly G. H. French No. 2062, from Carbondale and Leslie Hulbright No. B2280 from 3 miles south of Ava, both in Jackson County, and E. J. Palmer No. 16659 from Tunnel Hill, Johnson County, the plants approach *H. missouriensis* in degree of pubescence and in the size of the leaves but in flower, fruit and seed characters they are nevertheless quite typical var. *Rugelii.* Collections of *Heuchera* from Missouri which have been identified and reported either as *H. parviflora* or *H. Rugelii* are *H. puberula* Mackenzie & Bush. Most of them were made before the establishment of this species in 1905 but a few are also of later date. It is reasonable to expect that var. *Rugelii* may still turn up in Missouri since it occurs in at least two of the counties of Illinois bordering on the Mississippi River but so far I have no evidence that its range extends farther westward.

H. puberula is apparently a common and characteristic element of the Ozarkian flora of middle southern Missouri and adjoining parts of Arkansas, judging by the numerous collections of it preserved in the herbarium of the Missouri Botanical Garden. Of the more than two score sheets I have examined all are of collections from this circumscribed area with the solitary exception of one of W. W. Eggleston (No. 5467) ticketed "Plants of Leichfield Grayson County, Kentucky." Leichfield is situated more than 300 miles farther east than the nearest known station for the species in Missouri. The specimen in question is without doubt true *H. puberula* but the fact that I have seen no other collection of the species from the Leichfield region nor from anywhere else between there and the easternmost station in Missouri leads me to suspect that there may have been a mix-up of Eggleston labels with Missouri plants. An isolated occurrence of the species near the middle of Kentucky is of course possible but until it is corroborated by additional material there is good reason for being skeptical about it. *H. puberula* is readily distinguished from the other members of the *parviflora* group by the characteristic short glandular puberulence of stems, petioles and leaf surfaces. The puberulence varies from sparse to dense and in some cases a short portion of the petiole immediately below the leaf blades may be short glandular-villous. Very rarely plants are encountered with scattered longer glandular hairs on the

petioles. In a majority of specimens examined the under surface of the leaf is deep purple but this character is not constant and degrees of purpling occur sometimes in other members of the group. The bracts of *H. puberula* are dark brown in color, narrowly lanceolate and ciliate on the margins and either glabrous or only glandular-puberulent on the back. In the allied species the bracts vary from 3-lobed to trifid to broadly oblanceolate with fimbriate margins and are more or less rusty villous on the back. The flowers are normally larger than in the varieties of *H. parviflora* and in *H. missouriensis.* The sepals are usually green-tipped and the petals have a narrowly lanceolate blade and a long slender claw. Sometimes they are almost linear. The mature capsules are 4–5.5 mm. long and the seeds are short-fusiform and faintly ridged.

The plants are calciphile, and occur on moist shaded ledges of limestone bluffs. They are fall blooming, most of the specimens observed in full flowering condition being collected from the latter part of September until late October. *H. missouriensis* on the other hand blossoms during July.

The author wishes to express his thanks to Dr. Steyermark for kindly supplying him with material and data and to the Missouri Botanical Garden for the loan of specimens.

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SMILAX HISPIDA VERSUS S. TAMNOIDES

Robert T. Clausen

For many years, the Bristly Greenbrier of eastern North America has been designated by the appropriate name, *Smilax hispida.* In 1944, Prof. Fernald (Rhodora **46:** 38–39) changed his usage and argued that the correct name for this species should be *S. tamnoides,* the name which he adopted in the eighth edition of Gray's Manual. The purpose of the present short discussion is to evaluate the status of *S. tamnoides* and *S. hispida* as possible names for Bristly Greenbrier.

Linnaeus listed *Smilax tamnoides* in edition 1 of Species Plantarum. His brief description in Latin appeared on p. 1030 of vol. 2. Literally translated, this description indicates that *S.*

tamnoides has a prickly terete stem and leaves which are unarmed, many-nerved, cordate and oblong. Linnaeus cited Catesby's Natural History of Carolina, Florida and the Bahama Islands, vol. 1, p. 52, pl. 52, also he quoted the Latin name used by Catesby for the *Smilax*. From this polynomial designation the additional fact is available that the fruits are black. According to Linnaeus, *S. tamnoides* occurs in Carolina, Virginia and Pennsylvania.

Fernald stated in 1944 that *S. tamnoides* was based on two different items. The first was a specimen of the herbaceous *S. Pseudo-China*. The second and, according to Fernald, primary basis for Linnaeus' concept, was Catesby's plate 52 and accompanying description. According to Fernald's view, the plant illustrated and described by Catesby is the one which Coker (Jour. Elisha Mitchell Sci. Soc. 60: 48–49. 1944) called *Smilax hispida* var. *australis*.

S. tamnoides L. has been interpreted differently by various authors. Since Fernald stated that the species was based in part on a specimen which is the unarmed *S. Pseudo-China*, his view apparently is correct that the description of a prickly plant was not based primarily on the specimen in the Linnaeus herbarium. Accordingly, Catesby's description and illustration are all important in the typification of *S. tamnoides*. Readers who are able to consult Catesby's book will encounter a surprise when they examine plate 52. It depicts an anomalous greenbrier with a Crested Flycatcher perched upon it. The *Smilax* is anomalous because it has the long peduncles and clusters of 25–32 fruits characteristic of *S. Pseudo-China*, but, prickles and leaves as in *S. Bona-nox*. The prickles are sparse, slender, broadest at the base and green, quite unlike the abundant black bristles of *S. hispida*. In the description, Catesby described the peduncles as "above three inches long." This statement and illustration are in agreement with Coker's opinion expressed on p. 30 of the article already cited, that Catesby illustrated *S. tamnifolia* (= *S. Pseudo-China*) in plate 52. Coker's additional comment that Catesby's statement about the roots refers either to *S. lanceolata* or *S. auriculata* further illustrates the confusion about the interpretation of Catesby's plate 52. The impression created is that Catesby's illustration and description were pre-

pared from diverse materials. Probably no species exists with the combination of characteristics as depicted. In view of this situation, despite Fernald's claim that Catesby's plate is a beautiful match for *S. hispida* var. *australis*, a definite identification of this plate or accompanying description seems impossible. Catesby's *Smilax bryoniae nigrae foliis, caule spinoso, baccis nigris* is not capable of precise interpretation. If that is a primary basis for *S. tamnoides* L., as seems probable, then Linnaeus' name should be regarded as ambiguous. It should be deleted from further consideration. This conclusion enables us to continue to employ *S. hispida* Muhl. (Torrey, Fl. N. Y. **2:** 302. 1843), probably based on plants both from Pennsylvania and New York, and clearly described as with the stems hispid and with the supplementary notes by Torrey that the prickles are slender and the fertile flowers about six in an umbel.

The Bristly Greenbriers of the Coastal Plain of the southeastern states, from Virginia to Texas, appear to differ from the northern and upland plants in their pandurate leaves of somewhat firmer texture. These have been named *S. hispida* var. *australis* Norton in Small. In accordance with the recent action of the International Botanical Congress regarding nomenclaturally typical subspecies and varieties (See Science 112: 444. 1950), the variety with ovate leaves should now be designated as *S. hispida* var. *hispida*.

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Four Plants New to the Illinois Flora.—During my field work in 1950, I found three species which are apparently new to the Illinois flora. A high school teacher called my attention to a fourth species.

Specularia biflora (R. & S.) Fisch. & Mey.—Palmer and Steyermark[1] reported this species from 16 counties in southern Missouri. Fernald[2] reported its occurrence as far north as southern Kentucky and Missouri in the Mississippi valley but did not include Illinois. I found this plant in three sites, two in

[1] Ann. Mo. Bot. Gard. 22: 375–746. 1935.
[2] Gray's Manual of Botany, ed. 8. 1950.

Pulaski County, and the third in Johnson County, Illinois. Specimens in the herbarium of the Illinois State Natural History Survey are from the following localities.

Johnson Co.: Field, Borax Cave, west of Goreville, June 11, 1950, *R. A. Evers 23744*. Pulaski Co.: Waste place, Lock and Dam No. 53, east of Olmsted, June 10, 1950, *R. A. Evers 23574;* in a field, 1 mile north of Lock and Dam No. 53, east of Olmsted, June 10, 1950, *R. A. Evers 23582*.

Rudbeckia missouriensis Engelm.—While observing the flora of the rock and loess hill prairies on the bluffs of the Mississippi River, I first noticed a coneflower that did not have the aspect of the common Black-eyed Susan. Upon examination I found that the pales were not bristle-tipped and bristly-ciliate as in the Black-eyed Susan. I determined this coneflower as *Rudbeckia missouriensis* Engelm., took samples to the Missouri Botanical Garden, and in comparing found them to be conspecific with specimens of *Rudbeckia missouriensis* collected by J. A. Steyermark and others. Palmer and Steyermark (l. c.) reported this plant from "Southern and central Mo. south and east of a line drawn from St. Charles, Montgomery, Boone, Morgan, Hickory and Polk counties to Benton Co." Its occurrence in southwestern Illinois could very well be expected. I have collected specimens from the following localities.

Monroe Co.: Hill prairie south of Valmeyer, September 2, 1949, *R. A. Evers 20485;* July 9, 1950, *R. A. Evers 25180;* August 30, 1950, *R. A. Evers 27170;* hill prairie southeast of Fults, August 30, 1950, *R. A. Evers 27100;* rock prairie southeast of Fults, August 30, 1950, *R. A. Evers 27054*. Randolph Co.: Hill prairie above Columbia Quarry, north of Prairie du Rocher, July 29, 1950, *R. A. Evers 25648;* September 19, 1950, *R. A. Evers 27538, 27566;* hill prairie north of Columbia Quarry, north of Prairie du Rocher, September 19, 1950, *R. A. Evers 27595B*.

Heliotropium tenellum Michx.—This "delicate" heliotrope grows in eastern, central and southern Missouri according to Palmer and Steyermark. I found it growing on a rock ledge on the bluffs of the Mississippi River southeast of the village of Fults in Monroe County, Illinois. I have not found it in similar situations elsewhere in Monroe County nor in Randolph County to the south. Further search along the limestone ledges in southwestern Illinois may disclose a more extended range.

Monroe Co.: Rock ledge southeast of Fults, August 30, 1950, *R. A. Evers 27049*.

Eriochloa villosa (Thunb.) Kunth.—Mr. J. V. Myers, instructor in agriculture, Odell, Livingston County, Illinois, brought me a grass sample for identification. He later took me to corn and soybean fields near Odell where this grass was quite abundant and we collected samples. Dr. J. R. Swallen of the United States National Museum determined them as *Eriochloa villosa* (Thunb.) Kunth, the Hairy Cup-grass. In his communication, Dr. Swallen stated that this grass has been previously found on ballast in Portland, Oregon, and in El Paso County, Colorado. Its occurrence in Livingston County, Illinois, adds another Asiatic grass to the Illinois flora. In the fields near Odell, the Hairy Cup-grass apparently was more successful than *Setaria faberii* which was also present. It will be interesting to see whether or not it will spread and become a pest as has *Setaria faberii.*

Livingston Co.: In a cornfield, 3 miles east of Odell, August 25, 1950, *R. A. Evers & J. V. Myers 26812, 26813.*

—Robert A. Evers, Illinois State Natural History Survey, Urbana.

A Quicker More Satisfactory Method for Soaking and Re-pressing Dried Plant Specimens.—Poorly pressed plant specimens may be saved for mounting on herbarium sheets by an extension of the method of Fassett.[1] The specimens to be soaked are placed separately between metal corrugates as used in drying fresh plants and submerged in a very dilute solution (about 1 tablespoon per gallon water) of any household detergent such as "Dreft," "Vel," or "Tide." The stack of material should be weighted down to prevent the floating of particles or intermingling of different specimens. The specimens should be completely covered by the solution and allowed to soak for about twenty minutes for ordinary herbaceous species and thirty to thirty-five for tough woody and succulent species.

When soaking a number of plants together a simple numbering procedure, wherein corresponding numbers are placed between the corrugates and in the sheets from which the plants were

[1] Fassett, N. C., "Herbarium Technique," Rhodora 51: 59, 60. Mr. 1949.

taken, will enable their being reunited with their original label upon completion of re-pressing.

After the elapsed soaking periods prescribed above, the plant specimens are removed from the solution, excess water allowed to drain, and placed in dry collection sheets, blotters, etc., and dried in the usual manner.

The major advantages of this method are that it results in a quality of specimen far superior to that obtained from soaking in tap water before re-pressing. Also it saves time requiring three or four hours less for each group of specimens. The method has been used in the Herbarium of the United States National Arboretum for approximately one year. To date all the specimens so treated have exhibited no ill-effects.—Gabriel Edwin. U. S. National Arboretum, Bureau of Plant Industry, Soils, and Agricultural Engineering, Beltsville, Maryland.

A White form of Trilisa paniculata.—The three species of *Trilisa* of the southeastern United States all normally bear reddish-purple flowers. No white form of any of them is listed in the Gray Herbarium card catalog of new names, and there is no material of any in the U. S. National Herbarium or the herbarium of the National Arboretum. The finding of an albino form of *Trilisa paniculata* accordingly seems worthy to be placed on record, and the form may be provided with a Latin name as a means of documenting it in the literature.

Trilisa paniculata (Walt.) Cass. f. **alba**, forma nov. Phyllaria viridia; corollae et styli et pappus alba. South Carolina: Small colony of about 3 plants (one several-stemmed), among pines near main road, about 5 miles south of Little River, Horry County, 11 Oct. 1947, *S. F. Blake 12366* (type no. 243471, Herb. National Arboretum).—S. F. Blake, Division of Plant Exploration and Introduction, Plant Industry Station, Beltsville, Maryland.

Rocky Mountain Naturalists[1].—In this book portraits and biographies of nine leading naturalists, primarily of Colorado, are supplemented by a roster in biographical dictionary form, of natural history collectors of the Rocky Mountain area between 1682 and 1932. Separate chapters are de-

[1] Joseph Ewan. Rocky Mountain Naturalists. XV + 358 pp. (with nine portraits). Denver, Colorado. The University of Denver Press. $5.00.

voted to Edwin James, John C. Fremont, C. C. Parry, E. L. Greene, Thomas C. Porter, H. N. Patterson, Marcus E. Jones, Eugene Penard and T. D. A. Cockerell. To one interested in the natural history of Colorado, each of these chapters makes fascinating reading, for they not only treat of the men, but include as well a narrative of the exploration in which they participated. Stories of events and numerous facts are skillfully interwoven with biographical data to produce both pleasant and informative reading. The whole, of course, is laid on a historical as well as regional background. From the point of view of obtaining facts concerning naturalists of the region, the richest portion of the book begins with chapter XI, page 138, explanatory notes and bibliography, and extends through the section containing the roster of natural history collectors, to page 344. Thus over 200 pages are packed with facts and interesting items concerning the collectors mentioned. Much untapped source material has been utilized by Professor Ewan in assembling this portion of the book and he has made it a veritable storehouse of information not otherwise easily available. Where possible, he has indicated for each collector the nature and extent of the collections made and their ultimate disposition.

The fact that the book was developed from a series of essays on Colorado botanists has somewhat limited the final product. For example, seven of the nine men singled out for special treatment are botanists. Furthermore, naturalists of the Rocky Mountain area who did not work primarily in Colorado probably did not receive the same consideration for special treatment as those whose major activities were centered there. Of the botanists, we immediately think of P. A. Rydberg and Aven Nelson who were, in our judgement, as deserving of special treatment as Marcus E. Jones, Edward Lee Greene or, in fact, any of the botanists given such attention in the book. But it is certainly an author's prerogative to select the material he wishes to treat and it is doubtful whether any two potential authors would choose exactly the same men from the long list of possibilities for special biographical attention. On the whole, Professor Ewan has made a very substantial contribution to our organized information about the naturalists of the Rocky Mountain region, and has done so with skill and acumen. He deserves special commendation for the painstaking and thorough way in which he has gathered and presented his material.—R. C. Rollins.

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BRYOPHYTES OF VIRGINIA, III. COLLECTIONS MADE IN SOUTHEASTERN VIRGINIA BY BAYARD LONG

Paul M. Patterson

During the years 1934–1942, the late Professor M. L. Fernald of the Gray Herbarium of Harvard University, accompanied by Mr. Bayard Long of the Academy of Natural Sciences of Philadelphia, among others, made many collecting trips to the southeastern part of Virginia. Fernald's spectacular additions to the vascular flora of Virginia published during this period are well known. On these trips, in addition to the vascular plants, Mr. Long made representative collections of bryophytes as well, and kindly consented at the suggestion of Dr. W. C. Steere to let me examine them.

Mr. Long's series of 155 bryophytes in 490 numbers collected in 21 counties provides not only a good sample of the moss flora of the area, but also includes rare species, new records, and range extensions for the state. While these collections are not large, considering the territory covered, they are of good size when one considers that his primary interest centered on the collection of vascular plants. Furthermore, they show that a careful botanist can make representative and discriminating collections in a group with which he himself is relatively unfamiliar. For example, *Buxbaumia aphylla*, a very inconspicuous moss and one which is very generally overlooked even by bryologists themselves, is represented here by four different collections. Again, specimens of *Philonotis* usually seen are sterile; but all of his collections were in fruit, thus affording critical determinations in a group where sterile forms are often puzzling.

While a few of the common species are poorly represented, others are lacking or sparingly present because of the scarcity of certain habitats such as moist cliffs, boulders, and rocky creeks. However specimens were obtained from a variety of habitats ranging from low, boggy woods to sandy pine barrens, and from open ponds and swamps to dry fields.

Mr. Long's collections were made in 1934, 1937, 1939, 1940, 1941, and 1942; those of 1934 were named for the most part by Mr. E. B. Bartram. The collections were received in their original field folders. In each folder were placed the bryophytes collected at a specific habitat such as a decayed log. A number of these collections contained two to several sods of different bryophytes from the same identical place. In such a collection, when one species was packeted and assigned a number, if it was admixed with other bryophytes in the same collection, its name is not placed on the packets of the other associated species under separate numbers since this would erroneously increase the collections of this species. Individual collections containing but a single mixed sod do bear the names of the several bryophytes that occur together. These collections are located at the Academy of Natural Sciences of Philadelphia.

Various comments may be made upon a number of species in the collection. *Thuidium Alleni*, reported to occur in Virginia by Grout (1932), is represented by two collections (identity verified by W. C. Steere in one instance). This species is rather close to *T. delicatulum*, but in its typical form is readily distinguishable as are some other species close to *T. delicatulum*. A careful study of this species-group may possibly show intergradations requiring the reduction of some of them. The specific distinctness of *Thelia asprella* and *T. Lescurii* are equally open to challenge.

The only previous report of *Philonotis Muhlenbergii* in Virginia is that of Flowers (1935). A small piece of a sod of sterile *Bryum* in an admixture of other bryophytes was tentatively determined by Dr. A. LeRoy Andrews as *B. bicolor* and is listed below on this basis. The only earlier specific reference to this moss in Virginia is that of Small & Vail (1893).

There was a series of new records and range extensions reported by Iltis (1950) and Patterson (1950). Several are represented

in Mr. Long's collections. Two of these are hepatics: *Frullania Kunzei* and *Leucolejeunea conchifolia.* The rest are mosses: *Sphagnum cyclophyllum, S. compactum, S. tabulare, Fissidens Julianus, Helodium paludosum, Thelia Lescurii, Cryphaea glomerata,* and *Brachelyma subulatum.* While *Sphagnum compactum* and *Cryphaea glomerata* are now known to be rather frequent, the others are apparently not common and the presently reported collections make significant additions to the previously known records.

Mr. Long's collections add four new records to Virginia's bryophyte flora. *Philonotis longiseta* was recorded by Michaux in 1801 as *Bartramia longiseta* Rich. from the large territory then known as Virginia. Dr. A. J. Sharp collected a polygamous form of this normally synoecious species in eastern Tennessee which Flowers (1935) described as the new form *polygama.* All other species of *Philonotis* are dioecious. Mr. Long collected this polygamous form twice. Another new record is the variety *latifolia* of *Fontinalis novae-angliae,* an identification kindly made by Dr. Winona H. Welch.

There are two species of *Sphagnum* new to the state: *S. erythrocalyx* and *S. macrophyllum.* Andrews (1913) states that *S. erythrocalyx* extends as far north as New Jersey and Blomquist (1938) reports it to be common in the southeastern states. There are no other published records of this species in Virginia and its abundance here is yet to be determined. *S. macrophyllum,* one of the most distinctive of peatmosses, ranges from Maine to Florida and Louisiana along the coast but, apparently, is nowhere abundant. Sharp (1947) has reported its occurrence as far inland as the Cumberland plateau of Tennessee. There are now 22 species and varieties of *Sphagnum* known in Virginia. Blomquist (1938) records 27 species and varieties in the states south of Virginia. Sharp (1939) has found *S. pylaesii* and *S. squarrosum* in the Great Smoky Mountains of eastern Tennessee, but these are not known from Virginia. Similarly, Blomquist (1937) reports the northern *S. papillosum* and *S. squarrosum* and the southern *S. portoricense* from North Carolina. Thus, while there is a good representation of this group in Virginia, several others may be expected.

There are two striking range extensions in Mr. Long's collections. The hepatic, *Anthoceros Ravenelii,* is here reported for

the first time north of South Carolina. This is a very distinctive species with large (up to 100 micra), black, slightly roughened spores and ellipical to globular, irregularly thickened, unicellular elaters. The other is the moss, *Mnium cinclidioides*, normally occurring in cold bogs and swamps in northern United States and Canada. Its previous southernmost collection was reported by Andrews (1940) to be in New Jersey. Dr. Andrews, who confirmed the identification of this plant, states in a letter that he knows of no other record of it south of New Jersey since that time. While its occurrence in a high mountain bog would have been a real surprise, Mr. Long found it on the Coastal Plain, a short distance southeast of the city of Richmond in New Kent County at the "foot of (a) wooded slope, bottomland, along Chickahominy River at Sandy Bridge."

Omitting forms, this collection brings the known bryophytes occurring in Virginia to a total of 479 species and varieties.

In addition to those mentioned above, I am indebted to Dr. Lewis E. Anderson and Miss Lois Clark each for determining a specimen for me.

In the following list the collection numbers are given following the county name in which they were made.

HEPATICAE

Ptilidiaceae

Trichocolea tomentella (Ehrh.) Dum.—: Southampton, 2625; Sussex, 2740.

Lepidoziaceae

Lepidozia reptans (L.) Dum.—: Surry, 2455 in part.

Cephaloziaceae

Cephalozia bicuspidata (L.) Dum.—: Nansemond, 2777 in part.

Cephalozia media Lindb.—: Princess Anne, 2786.

Nowellia curvifolia (Dicks.) Mitt.—: Nansemond, 2777.

Odontoschisma prostratum (Sw.) Trevis.—: King William, 2606; Greensville, 2626; James City, 2573; Nansemond, 2775, & 2856 in part; Norfolk, 2801 in part; Princess Anne, 2399, & 2403 in part; Surry, 2455 in part, & 2667.

Harpanthaceae

Lophocolea bidentata (L.) Dum.—: Surry, 2704 in part.

Lophocolea heterophylla (Schrad.) Dum.—: Greensville, 2836; Nansemond, 2665 in part.

Marsupellaceae

Marsupella sphacelata (Gieseke) Dum.—: Nansemond, 2563.

PLAGIOCHILACEAE

Plagiochila asplenioides (L.) Dum.—: Greensville, 2624.

SCAPANIACEAE

Scapania nemorosa (L.) Dum.—: Greensville, 2836 in part; James City, 2599; Nansemond, 2593 in part; Princess Anne, 2432 & 2388; Sussex, 2762 & 2765.

PORELLACEAE

Porella pinnata L.—: Greensville, 2586.

RADULACEAE

Radula obconica Sull.—: Norfolk, 2800.

FRULLANIACEAE

Frullania Asagrayana Mont.—: Prince George, 2813; Princess Anne, 2408 in part.

Frullania Brittoniae Evans—: James City, 2864; Princess Anne, 2412; Southampton, 2647.

Frullania eboracensis Gottsche—: Norfolk, 2792.

Frullania Kunzei Lehm. & Lindb.—: Isle of Wight, 2679.

LEJEUNEACEAE

Leucolejeunea clypeata (Schwein.) Evans—: Greensville, 2587 in part; Norfolk, 2793.

Leucolejeunea conchifolia Evans—: Isle of Wight, 2679 in part.

Leucolejeunea unciloba (Lindb.) Evans—: Princess Anne, 2437 in part.

PELLIACEAE

Pellia epiphylla (L.) Corda—: Henrico, 2618.

PALLAVICINIACEAE

Pallavicinia Lyellii (Hook.) S. F. Gray—: Greensville, 2840; New Kent, 2554; Norfolk, 2801; Princess Anne, 2415; Sussex, 2480, 2698, & 2763.

METZGERIACEAE

Metzgeria furcata (L.) Dum.—: Greensville, 2584.

RICCARDIACEAE

Riccardia multifida (L.) S. F. Gray—: Norfolk, 2802.

Riccardia palmata (Hedw.) Carruth.—: Sussex, 2461.

Riccardia pinguis (L.) S. F. Gray—: King William, 2607.

MARCHANTIACEAE

Marchantia polymorpha L.—: Isle of Wight, 2751.

Conocephalum conicum (L.) Dum.—: Southampton, 2634; Surry, 2653.

REBOULIACEAE

Asterella tenella (L.) Beauv.—: Greensville, 2627; Sussex, 2669.

Reboulia hemisphaerica (L.) Raddi—: Southampton, 2628, & 2642.

Ricciaceae

Riccia fluitans L.—: Norfolk, 2808.

Anthocerotaceae

Anthoceros Ravenelii Aust.—: Southampton, 2675.

BRYINAE

Sphagnaceae

Sphagnum capillaceum (Weiss) Schrank var. *tenellum* (Schimp.) Andrews—: Nansemond, 2519; Princess Anne, 2784.

Sphagnum cuspidatum Ehrh. var. *Torreyi* (Sull.) Braith.—: Nansemond, 2564.

Sphagnum cyclophyllum Sull. & Lesq.—: Dinwiddie, 2458; Greensville, 2479; Princess Anne, 2409.

Sphagnum compactum DC.—: Nansemond, 2855.

Sphagnum erythrocalyx Hampe—: Isle of Wight, 2873; Nansemond, 2529.

Sphagnum imbricatum Hornsch.—: Greensville, 2841; Isle of Wight, 2857; Nansemond, 2566; Southampton, 2565; Surry, 2456.

Sphagnum imbricatum Hornsch. var. *affine* (R. & C.) Warnst.—: Norfolk, 2818.

Sphagnum macrophyllum Bernh.—: York, 2447.

Sphagnum magellanicum Brid.—: Nansemond, 2518; Princess Anne, 2785.

Sphagnum palustre L.—: King & Queen, 2770; Nansemond, 2772; Norfolk, 2810.

Sphagnum recurvum Beauv.—: Sussex, 2682.

Sphagnum subsecundum Nees—: Caroline, 2845; Dinwiddie, 2832; Greensville, 2471; Norfolk, 2773, & 2854; Prince George, 2811; Sussex, 2699.

Sphagnum tabulare Sull.—: King William, 2604.

Tetraphidaceae

Tetraphis pellucida Hedw.—: Nansemond, 2592.

Polytrichaceae

Atrichum undulatum (Hedw.) Beauv.—: Dinwiddie, 2448; Nansemond, 2567; Norfolk, 2797; Southampton, 2591, & 2643.

Atrichum xanthopelma (C. Muel.) Jaeg. & Sauerb. —: Charles City, 2578; Surry, 2617.

Pogonatum brachyphyllum (Rich.) Beauv.—: Charles City, 2610; Dinwiddie, 2645, & 2824; Greensville, 2622.

Pogonatum pensilvanicum (Hedw.) Paris—: Nansemond, 2450; Sussex, 2555.

Polytrichum commune Hedw.—: Dinwiddie, 2825; Norfolk, 2395, & 2853; Princess Anne, 2397.

Polytrichum juniperinum Hedw.—: Isle of Wight, 2848, & 2861; Nansemond, 2513, & 2651.

Polytrichum ohioense Ren. & Card.—: James City, 2597; Surry, 2660.

Fissidentaceae

Fissidens adiantoides Hedw.—: Surry, 2683.

Fissidens cristatus Wils.—: Greensville, 2464, 2585, & 2723 in part; Nansemond, 2760; Princess Anne 2438; Prince George, 2595; Southampton, 2570; Sussex, 2460, & 2462.

Fissidens Julianus (Mont.) Schimp.—: Isle of Wight, 2735; Norfolk, 2820.

Fissidens taxifolius Hedw.—: Surry, 2729.

Ditrichaceae

Ceratodon purpureus (Hedw.) Brid.—: Isle of Wight, 2663, & 2684.

Ditrichum pallidum (Hedw.) Hampe—: Dinwiddie, 2556, & 2661; James City, 2598; Nansemond, 2658, & 2856; Princess Anne, 2389, 2391, 2419, & 2783.

Ditrichum pusillum (Hedw.) E. G. Britton—: Princess Anne, 2396.

Pleuridium subulatum (Hedw.) Lindb.—: Sussex, 2454.

Dicranaceae

Dicranella heteromalla (Hedw.) Schimp.—: Southampton, 2628 in part; Surry, 2752; Sussex, 2459.

Dicranella heteromalla (Hedw.) Schimp. var. *orthocarpa* (Hedw.) Paris—: Southampton, 2524.

Dicranum condensatum Hedw.—: James City, 2574; Nansemond, 2467, 2514, & 2652; Princess Anne, 2413.

Dicranum flagellare Hedw.—: Nansemond, 2534; Princess Anne, 2545 in part, & 2789.

Dicranum scoparium Hedw.—: Dinwiddie, 2449, & 2828; Greensville, 2546; Nansemond, 2515; New Kent, 2601; Princess Anne, 2429, 2440, 2401, & 2788; Surry, 2613; Sussex, 2549.

Leucobryaceae

Leucobryum albidum (Brid.) Lindb.—: Caroline, 2453 in part; Dinwiddie, 2829; Greensville, 2547; James City, 2572; Nansemond, 2615; Princess Anne, 2390, 2394, 2436 in part, 2441, 2545 in part, 2782, & 2791.

Leucobryum glaucum (Hedw.) Schimp.—: Henrico, 2636; Nansemond, 2510, & 2774; Southampton, 2538.

Calymperaceae

Syrrhopodon texanus Sull.—: Princess Anne, 2725.

Buxbaumiaceae

Buxbaumia aphylla Hedw.—: James City, 2621; Nansemond, 2666; Southampton, 2673; Sussex, 2747.

Diphyscium foliosum (Hedw.) Mohr.—: Henrico, 2445; Isle of Wight, 2676; King George, 2869; Nansemond, 2757, & 2778; Southampton, 2689; Surry, 2455, 2667, & 2715; Sussex, 2749.

Pottiaceae

Barbula unguiculata Hedw.—: Isle of Wight, 2817; Sussex, 2550.

Gymnostomum calcareum Nees & Hornsch.—: Isle of Wight, 2738.

Gymnostomum recurvirostrum Hedw.—: Isle of Wight, 2739.

Tortella humilis (Hedw.) Jennings—: Nansemond, 2536; Surry, 2630.

Tortula muralis Hedw.—: Dinwiddie, 2603.

Weisia viridula Hedw.—: Dinwiddie, 2662; Isle of Wight, 2706, & 2742; Nansemond, 2664; Prince George, 2640; Princess Anne, 2392, & 2420; Sussex, 2654.

Grimmiaceae

Grimmia apocarpa Hedw.—: Sussex, 2542.

Hedwigia ciliata Hedw.—: Greensville, 2718; Sussex, 2543, 2551, 2620, & 2633.

Ptychomitrium Drummondii Sull.—: Southampton, 2489; Surry, 2528; Sussex, 2692, & 2693.

Funariaceae

Funaria flavicans Mx.—: Henrico, 2614.

Funaria hygrometrica Hedw.—: Norfolk, 2871.

Physcomitrium turbinatum (Mx.) Brid.—: Surry 2872.

Orthotrichaceae

Orthotrichum pumilum Dicks.—: James City, 2863.

Orthotrichum strangulatum Schwaegr.—: Princess Anne, 2425.

Aulacomniaceae

Aulacomnium heterostichum (Hedw.) B. S. G.—: James City, 2631; Prince George, 2638; Southampton, 2494; Surry, 2655, & 2714; York, 2677.

Aulacomnium palustre (W. & M.) Schwaegr.—: Dinwiddie, 2826; Nansemond, 2674; Norfolk, 2809; Princess Anne, 2403.

Bartramiaceae

Bartramia pomiformis Hedw.—: Charles City, 2577, & 2637; Greensville, 2835; James City 2632; Southampton, 2495, 2539, & 2649; Surry, 2612, & 2728.

Philonotis longiseta (Rich.) E. G. Britton, forma *polygama* Flowers—: Prince George, 2611, & 2668.

Philonotis marchica (Willd.) Brid.—: Isle of Wight, 2705, 2724, 2737, & 2816; Surry, 2616.

Philonotis Muhlenbergii (Schwaegr.) Brid.—: Isle of Wight, 2750.

Bryaceae

Bryum argenteum Hedw.—: Southampton, 2533, & 2657; Sussex, 2619.

Bryum bicolor Dicks.—: Sussex, 2551a.

Bryum pseudotriquetrum (Hedw.) Schwaegr.—: Isle of Wight, 2753.

Pohlia Wahlenbergii (W. & M.) Andrews—: Southampton, 2490; King William, 2605.

Rhodobryum roseum (B. S. G.) Limpr.—: Southampton, 2648; Surry, 2711.

Mniaceae

Mnium affine Bland.—: Greensville, 2721 & 2722.

Mnium cinclidioides Hüben.—: New Kent, 2558.

Mnium cuspidatum Hedw.—: Essex, 2846 in part; Greensville, 2473, & 2580; Nansemond, 2755; Norfolk, 2444; Princess Anne, 2517; Southampton, 2508, 2650, & 2670; Surry, 2653 in part, 2704 in part, & 2712; Sussex, 2481, & 2701.

Mnium hornum Hedw.—: Nansemond, 2761.

Mnium punctatum Hedw. var. *elatum* Schimp.—: Sussex, 2741.

Hypnaceae

Amblystegium Juratzkanum Schimp.—: Sussex, 2461 in part.

Amblystegium varium (Hedw.) Lindb.—: Caroline, 2858; Essex, 2846 in part, & 2847; Isle of Wight, 2736 in part; James City, 2769 in part; Surry, 2457 in part, 2498, & 2635.

Brachythecium oxycladon (Brid.) J. & S.—: Charles City, 2579; Norfolk, 2796, & 2798; Southampton, 2521.

Brachythecium rutabulum (Hedw.) B. S. G.—: Caroline, 2849.

Brachythecium salebrosum (W. & M.) B. S. G.—: Nansemond, 2759 in part.

Bryhnia graminicolor (Brid.) Grout—: York, 2678.

Campylium hispidulum (Brid.) Mitt.—: Princess Anne, 2431; Surry, 2630 in part.

Cirriphyllum Boscii (Schwaegr.) Grout—: Greensville, 2720, & 2834; Isle of Wight, 2676 in part; Nansemond, 2501; New Kent, 2600; Princess Anne, 2427, 2435, & 2436; Southampton, 2492, 2520, 2539 in part, & 2569; Surry, 2500.

Climacium americanum Brid.—: Greensville, 2472; Nansemond, 2756; Norfolk, 2443; Southampton, 2537, & 2671; Sussex, 2697.

Climacium Kindbergii (R. & C.) Grout—: Caroline, 2870; Greensville, 2580 in part; King William, 2608; Nansemond, 2748 in part; Norfolk, 2801 in part, & 2852; Prince George, 2812; Princess Anne, 2404; Southampton, 2486, 2496 in part, 2507, & 2560.

Entodon cladorrhizans (Hedw.) C. Müll.—: Caroline, 2859.

Entodon seductrix (Hedw.) C. Müll.—: Charles City, 2561; Greensville, 2581, & 2839; James City, 2531, & 2766; Nansemond, 2589; New Kent, 2596; Norfolk, 2851; Princess Anne, 2516; Southampton, 2487, 2488, & 2623; Sussex, 2548, & 2688.

Eurhynchium hians (Hedw.) J. & S.—: Isle of Wight, 2707 in part; Norfolk, 2795; Surry, 2710; York, 2678 in part.

Eurhynchium rusciforme (Neck.) Milde—: Greensville, 2823.

Eurhynchium serrulatum (Hedw.) Kindb.—: Dinwiddie, 2830; Essex, 2846; Prince George, 2639; Princess Anne, 2393, 2400, & 2430; Southampton, 2541, & 2644; Surry, 2716, & 2727.

Eurhynchium strigosum (Hoffm.) B. S. G.—: Nansemond, 2503; Southampton, 2523.

Homalotheciella fabrofolia (Grout) Broth.—: Greensville, 2587.

Hygroamblystegium irriguum (Wils.) Loeske—: James City, 2767, & 2865.

Hygroamblystegium orthocladon (P. B.) Grout—: Sussex, 2659.

Hypnum curvifolium Hedw.—: Nansemond, 2512, 2593, & 2754; Southampton, 2485; Surry, 2629.

Hypnum imponens Hedw.—: James City, 2575.

Hypnum molluscum Hedw.—: Prince George, 2641; Norfolk, 2800 in part.

Hypnum Patientiae Lindb.—: Greensville, 2469 in part, 2734, 2833, & 2838; James City, 2530, & 2769; King William, 2609; Nansemond, 2748; Norfolk, 2806; Prince George, 2815; Princess Anne, 2405, & 2787; Southampton, 2497, 2504, 2646, 2672, & 2731 in part; Surry, 2780; Sussex, 2700 in part, & 2484.

Leptodictyum riparium (Hedw.) Warnst.—: Caroline, 2844; Greensville, 2469, & 2843; Isle of Wight, 2708, & 2744; James City, 2865 in part; Norfolk,

2803; Princess Anne, 2410, & 2695; Southampton, 2477, 2560 in part; Sussex, 2702.

Leptodictyum trichopodium (Schultz) Warnst. var. *Kochii* (B. S. G.) Broth. —: Surry, 2656, & 2726.

Plagiothecium micans (Sw.) Paris—: Caroline, 2453; Dinwiddie, 2557 Greensville, 2862; King William, 2732; Nansemond, 2534 in part, 2771, & 2776; Norfolk, 2804; Princess Anne, 2386, 2414, 2421, 2545, 2725 in part, & 2786 in part; Sussex, 2685 in part, & 2842.

Plagiothecium sylvaticum (Brid.) B. S. G.—: Southampton, 2476.

Platygyrium repens (Brid.) B. S. G.—: Princess Anne, 2408.

Pylaisia Selwynii Kindb.—: Caroline, 2452; York, 2680.

Sematophyllum adnatum (Mx.) E. G. Britton—: Greensville, 2837; Isle of Wight, 2679 in part; Norfolk, 2428, & 2821; Princess Anne, 2416, 2433, & 2434.

Leskeaceae

Anomodon attenuatus (Hedw.) Hüben.—: Charles City, 2576; Greensville, 2475, 2582, & 2733; James City, 2766 in part, 2768 in part; Nansemond, 2511, & 2590; Norfolk, 2799; Prince George, 2814; Princess Anne, 2407, & 2418; Southampton, 2493, 2569 in part, & 2875; Surry, 2717; Sussex, 2483, & 2703.

Anomodon minor (Beauv.) Lindb.—: Greensville, 2465.

Anomodon rostratus (Hedw.) Schimp.—: Greensville, 2723; Isle of Wight, 2707 & 2736; Southampton, 2522 in part; Surry, 2499.

Haplohymenium triste (Cesati) Kindb.—: Princess Anne, 2437 in part.

Helodium paludosum (Sull.) Austin—: Charles City, 2553.

Leskea arenicola Best—: Sussex, 2694.

Leskea gracilescens Hedw.—: Norfolk, 2790; Southampton, 2477 in part & 2491; Surry, 2526.

Leskea obscura Hedw.—: Southampton, 2496; Sussex, 2745.

Thelia asprella Sull.—: Nansemond, 2535; Norfolk, 2850.

Thelia Lescurii Sull.—: Isle of Wight, 2866; Nansemond, 2665 in part.

Thelia hirtella (Hedw.) Sull.—: James City, 2532; New Kent, 2779; Princess Anne, 2402, 2406, & 2417; Southampton, 2451.

Thuidium Alleni Austin—: Norfolk, 2805; Princess Anne, 2411.

Thuidium delicatulum (Hedw.) Mitt.—: Dinwiddie, 2627; Greensville, 2422 in part, 2468, 2505, 2580 in part, 2583, 2719, & 2822; Nansemond, 2502, & 2593 in part; New Kent, 2562, & 2602; Norfolk, 2426, 2805, & 2850 in part; Princess Anne, 2387, & 2439; Southampton, 2509, 2522, 2540, & 2591 in part; Surry, 2613 in part, 2709, & 2713; Sussex, 2463, & 2552.

Thuidium microphyllum (Hedw.) Best—: Caroline, 2860; Greensville, 2466, 2470, 2506, 2837 in part, & 2862 in part; Nansemond, 2665, & 2759; Southampton, 2731; Surry, 2780 in part; Sussex, 2685, 2690, 2691, 2700, & 2746.

Thuidium minutulum (Hedw.) B. S. G.—: Surry, 2457, & 2704.

Leucodontaceae

Leptodon trichomitrion (Hedw.) Mohr.—: Greensville, 2474, & 2831; James City, 2768; Norfolk, 2794; Southampton, 2874; Sussex, 2482.

Leucodon julaceus (Hedw.) Sull.—: Charles City, 2571; Greensville, 2587 in part; Nansemond, 2594; Princess Anne, 2398, 2422, 2437, 2442, & 2686; Southampton, 2446, 2478, & 2568; Surry, 2525; York, 2681.

Cryphaea glomerata Schimp.—: Nansemond, 2544; Princess Anne, 2423.

Clasmatodon parvulus (Hampe) Sull.—: Greensville, 2730; Princess Anne, 2424, & 2687; Southampton, 2491 in part.

Schwetschkeopsis denticulata (Sull.) Broth.—: Greensville, 2588.

Brachelyma subulatum (Beauv.) Schimp.—: Southampton, 2781.

Fontinalis dalecarlica B. S. G.—: Surry, 2743; Sussex, 2696.

Fontinalis novae-angliae Sull.—: Southampton, 2559; Sussex, 2763 in part, & 2764.

Fontinalis novae-angliae Sull. var. *latifolia* Card.—: Norfolk, 2867.

CORRECTIONS AND NOTES

A note should be made here concerning some printer's errors in my previous paper (1950). The report of Iltis (1950) of *Plagiochila Sullivantii* Gottsche should be noted there as his is the first report of this hepatic since that of Sullivant. On page 40, line 5, the first mention of *Sphagnum strictum* should read *Sphagnum compactum* DC. and it is represented in Dinwiddie County, among others, by Correll's collection No. 11521. Several other errors are of lesser importance and thus not enumerated.

Atrichum xanthopelma has been previously listed in this series as *A. Macmillani* (Holz.) Frye. In a recent study, Frye (1949) indicates the former to be the correct name. That it is a common moss of the coastal plain was noted in my paper (l. c.). Schornherst (1950) has reported that it is much more common than *A. angustatum* on the coastal plain of Georgia, and my collections confirm this for southeastern Virginia.—Hollins College, Virginia.

Literature Cited

Andrews, A. Leroy. 1913. Sphagnales. North American Flora **15** (1).

————. 1940. Mniaceae. *In* Grout, A. J., Moss flora of North America north of Mexico. II (4). 1928–1940.

Blomquist, H. L. 1937. Mosses of North Carolina. I. Sphagnales. The Bryologist. **40**: 67–71.

————. 1938. Peatmosses of the southeastern states. Jour. Elisha Mitchell Sci. Soc. **54**: 1–21.

Flowers, Seville. 1935. Bartramiaceae. *In* Grout, A. J., Moss flora of North America north of Mexico. II (3). 1928–1940.

Frye, T. C. 1949. Atrichum xanthopelma. The Bryologist. **52**: 191–194.

Grout, A. J. 1932. Moss flora of North America north of Mexico. III (3). 1928–1940.

Iltis, H. H. 1950. Studies in Virginia plants I. List of bryophytes from the vicinity of Fredericksburg, Virginia. Castanea. **15**: 38–50.

Patterson, P. M. 1950. The bryophytes of Virginia. II. New or noteworthy records. The Bryologist. **53**: 27–42.

Schornherst, Ruth O. 1950. Atrichum in the coastal plain. The Bryologist. **53**: 138.

Sharp, A. J. 1939. Taxonomic and ecological studies of eastern Tennessee bryophytes. Amer. Midl. Nat. **21**: 267–353.

————. 1947. Another coastal Sphagnum in Tennessee. The Bryologist. **50**: 402.

Small, J. K. and Anna Murray Vail. 1893. Report of the botanical exploration of southwestern Virginia during the season of 1892. Mem. Torrey Bot. Club. **4**: 93–201.

ADDITIONAL COLLECTIONS OF ANDROPOGON ELLIOTTII CHAPM. IN SOUTHERN ILLINOIS

John W. Voigt

The Elliott Beardgrass (Fig. 1a) is fairly well distributed in the coastal and Piedmont region, New Jersey, Florida, Texas, Missouri, Indiana, and Tennessee.[1] The species was first collected in Illinois in 1939 by L. E. Yaeger. This collection, made in Gallatin County, three miles southeast of Ridgeway, was partly the basis for the first report of Elliott Beardgrass in Illinois by Evers (1950),[2] who made ten collections of the grass in five southern counties.

My first collection made October 28, 1950 about six miles west of Bell Smith Springs in Pope County, was found on open ground of an abandoned field. The vegetative cover of the old field was principally composed of wire grass (*Aristida* spp.) and broomsedge (*Andropogon virginicus*). Local communities of Elliott Beardgrass were found occupying areas which were mostly circular and ranged from small tufts to larger areas of 30 feet and more in diameter. It was surrounded or accompanied by *Andropogon virginicus* which exceeded it in abundance. Upon leaving the area, *Andropogon elliottii* was observed along the roadsides for a distance of about a mile. I have made five collections in four counties. A station for Union County is heretofore unreported (Fig. 1b). My other collections are,

[1] Blomquist, H. L. 1948. The Grasses of North Carolina. Duke University Press, Durham, North Carolina.

[2] Evers, R. A. 1950. Andropogon elliottii Chapm. in Illinois. Rhodora, vol. 52., No. 614 pp. 45–46.

with one exception, from different locations within counties recently reported by Evers.

Present known distribution shows this grass in the following counties: Gallatin (three collections), Hardin (three collections), Pope (five collections), Saline (three collections), Johnson (two

1a.

1b

FIG. 1a. Elliott Beardgrass (Andropogon elliottii Chapm.) × ⅕
FIG. 1b. A map of the sixteen southernmost counties of the State of Illinois. The collection from Union County is heretofore unreported. The black dots represent the author's collections. Map adapted from Leighton, Ekblau and Horberg.

collections), and Union (one collection). According to Evers the known collections were all within the unglaciated section of southern Illinois with the exception of that by Yaeger in Gallatin County. The present collections are within this area also. Ecologically, *Andropogon elliottii* seems to be a species of narrow amplitude.

Specimens are deposited in the herbarium of the University of Illinois, the herbarium of the State Museum, Springfield, Illinois, and the botany herbarium of Southern Illinois University, Carbondale, Illinois. The collection data are as follows: POPE CO.:

In an old field, open ground, poor eroded and gravelly soil, six miles west of Bell Smith Springs. October 28, 1950, *Voigt 455;* on roadside shoulder about two miles north of Delwood, near the county line, November 4, 1950, *Voigt 458.* Johnson Co.: Roadside shoulder about 1 mile east of Ozark, November 4, 1950, *Voigt 460.* Saline Co.: Roadside shoulder about 1 mile south of Rudement, November 4, 1950, *Voigt 459.* Union Co.: Field alongside the road in Giant City State Park, November 17, 1950, *Voigt 461.*

MORE ADDITIONS TO THE OKLAHOMA FLORA

U. T. Waterfall

Field and herbarium studies made during the past year have provided additional data concerning plants little-known in our flora, or whose distribution the author finds previously recorded in floras and monographs from areas outside our state. Names of the latter are prefixed with an asterisk in this account. There are 17 such taxons recorded here.

The specimens cited in this paper may be found either in our herbarium at Oklahoma A. & M. College, or in the herbarium of the University of Oklahoma at Norman, or in both herbaria.

*Cyptopteris fragilis (L.) Bernh., forma dentata (Dickson) Clute. The form in which most of the pinnae are undivided, or merely lobed, is represented by *Waterfall* 9569, Dripping Springs Canyon, 6 miles west of state line, west of Siloam Springs, Delaware County, July 7, 1950.

*Aira caryophyllea L. was collected as *Waterfall* 9537, Camp Gruber, 1½ miles northeast of Braggs, Muskogee County, June 30, 1950. Two other introduced species were found in the same general area, possibly brought in with Bermuda grass or clover seed when the site was an army camp. They are *Vulpia myuros* and *Trifolium resupinatum.*

*Vulpia myuros (L.) K. C. Gmel. was collected as *Featherly, sin. num.*, Camp Gruber area, 1 mile north of Braggs, Muskogee County, June 12, 1950. According to Fernald (*Gray's Manual*, ed. 8: 108. 1950) it has been collected from "s. Me. to Wis. s. to Fla., La., and Tex."

*Carex Joori Bailey. This species was collected as *Waterfall* 8499, edges of cypress (*Taxodium*) swamp, 9 miles east and 2½ miles south of Broken Bow, McCurtain County, Aug. 8, 1948. Fernald (*Gray's Manual*, ed. 8: 347. 1950) states that the western limit of the species' range is ". . . Texas . . . se. Mo." In the *N. Am. Fl.* 18 (6): 345. 1935, essentially the same western limit is given: "Louisiana, Texas, Arkansas . . . southeastern Missouri."

SMILACINA RACEMOSA (L.) Desf., var. CYLINDRATA Fern. RHODORA 40: 406. 1938. Fernald (*loc. cit*) includes "Kansas and Colorado" as the southern limit of his range citation for var. *cylindrata*. Our material of this species is referable to the variety with long peduncles and rather cylindrical racemes. However this is as should be expected, since var. *cylindrata* is the southern variety.

*SELINOCARPUS DIFFUSUS Gray. So referred is *Waterfall* 9001, shallow silty soil on gypsum, 6 miles south of Hollis, Harmon Co., June 15, 1949; *Waterfall* 9405, same locality, May 13, 1950; *Waterfall* 9431, 3 miles east and 7½ miles south of Hollis, Harmon Co., May 13, 1950. All of these collections have only cleistogamous flowers. Moreover the author examined hundreds of plants in this vicinity and found only cleistogamous flowers on all of them. Gray (*Am. Journ. Sci.* 15: 262. 1853) in describing the species stated: "The unopened perigonium of the precociously fructified flowers, which persists until the fruit is ripe, does not exceed a line in length; while the fully developed flowers are an inch and a half long." Standley (*Contr. U. S. Natl. Herb.* 12: 388) says "The flowers of the species are often cleistogamous, but on specimens of the species proper fully developed flowers can almost always be found." Plants were dug up for further observation. One of them flowered in the greenhouse in September, 1950. It had on it fully developed flowers 4 centimeters in length. Johnston (*Journ. Arn. Arb.* 25: 162. 1944) states that the species is known from the bluffs along the Rio Grande, "central Texas, northern trans-Pecos Texas, and northwestward through New Mexico".

*CLAYTONIA VIRGINICA L., forma MICROPETALA Fern. RHODORA 40: 415. 1938. The small-flowered form of *C. virginica* was collected as *Waterfall* 9274, prairie, 16 miles southeast of Ada, in Coal County, April 15, 1950.

*CLEMATIS CRISPA L. This erect little *Clematis* with the upper third of the sepals dilated into broad, crisped, petaloid margins was found in open oak woods, on flats with palmettos, 3 miles south of Tom, McCurtain County, on April 16, 1950. It was collected as *Waterfall* 9294. Fernald (*Gray's Manual*, ed. 8: 665) states that the range of this species is "Fla. to Tex., n. to se. Va., s. Ill. and s. Mo."

*THALICTRUM ARKANSANUM Boivin. So referred is *Waterfall* 9308, in woods, edge of swamps, 4 miles south and 2 west of Tom, McCurtain Co., April 16, 1950. This collection has the tuberous, fascicled roots, the ellipsoid, or oblong-ellipsoid fruits with 5 or 6 nerves on each side as described for *T. arkansanum*. Boivin[1] cites material from Arkansas only, two of the collections being from nearby Texarkana and Fulton.

*DRABA CUNEIFOLIA Nutt., var. HELLERI (Small) O. E. Schultz. So referred are *Rotha Bull* 38, (O. U.) Wichita Mountains, March 7, 1931 and *Milton Hopkins*, southwest slopes of granite boulders in the Wichita Mountains, Comanche County, April 24, 1938. This material has the strigose, ellipsoid-oblong siliques of var. *Helleri:* however, on Rotha Bull's

[1] Boivin, Bernard. *American Thalictra and their Old World Allies.* RHODORA 46: 433. 1944.

collections the pedicels are as long as 8 mm., rather than only 3 mm. as Fernald describes that variety.[2]

Rosa setigera Michx., var. tomentosa T. & G. So referred is *Waterfall* 9604, forming dense clumps in prairie openings in woods, 2 miles east of Braggs, Muskogee County, June 17, 1950. Fernald (*Gray's Manual*, ed. 8: 870. 1950) says the variety extends from "W. Ga. to e. Tex., n. to s. Ont., Ohio, n. Ind., Ill., and Neb." In the *N. Am. Fl.* 22 (6): 491, the western limit of the range (as *R. rubifolia* R. Br.) is given as "Texas and Nebraska."

*Trifolium resupinatum L. This little clover with purplish flowers having the standard turned outward, and with swollen, reticulate, pubescent fruiting calyces was collected in the Camp Gruber area, 1 mile north of Braggs, Muskogee County, May 6, 1950. It was taken as *Waterfall* 9386.

Sphaeralcea angusta (Gray) Fern. In *Gray's Manual*, ed. 8, 1003. 1950, this species is said to range from "Ill. and Ia. to Ala., Mo., and Kansas". Stemen and Myers (*Okla. Flora:* 317. 1937) include it, merely stating "Dry soil. Summer". We have it as: *Waterfall* 8894, growing with *Sida procumbens* on shallow soil on limestone, 3½ miles east of Idabel, McCurtain County, June 7, 1947; *Waterfall* 9260, open post oak—black jack woods, 3 miles south of Kingston, Marshall County, August 27, 1949.

*Thaspium trifoliatum (L.) Gray, var. flavum Blake. In the herbarium of Oklahoma A. & M. College is one sheet so referable. It is *Kirby* 72, limestone soil, 5½ miles south of Jay, Delaware Co., Sept. 22, 1940. In the *North American Flora*, 28B (2): 188. 1945, the distribution is given as "Pennsylvania and North Carolina, west to Ontario and Arkansas."

*Swertia caroliniensis (Walt.) Ktze. is represented in our herbarium by *Sooter* 174, oak-pine forest in bottom of Mountain Fork River, State Game Preserve, 21 miles north and 10 miles east of Broken Bow, McCurtain Co., July 19, 1950. In *Gray's Manual*, ed. 8, the range is given as "Ga. to La., n. to w. N. Y., s. Ont., Mich. and Wisc."

*Sarcostemma crispum Benth. This crisp-leaved species of *Sarcostemma* is represented by *Waterfall* 7772, gypsum hills along the Elm Fork of the Red River, 3 miles west and 14 south of Erick in Harmon County, June 3, 1947. Cory (*Catalogue of the Flora of Texas*. 83. 1938) lists the species from areas 3, 5 and 6, Rio Grande Plains, Edwards Plateau and the Trans-Pecos Area. It is not listed from the Plains country between the Edwards Plateau and southwestern Oklahoma, but undoubtedly must occur in some of the rougher parts of this area, particularly in the "breaks" near rivers, or sites where *Juniperus Pinchoti* is to be found.

*Kickxia Elatine (L.) Dumort was collected as *Waterfall* 9660 along small stream running through wooded limestone and shale hills, 2 miles

[2] Fernald, M. L., *Draba in Temperate Northeastern America*. Rhodora 36: 367. 1934.

east of Tahlequah, Cherokee Co., July 31, 1950. Pennell[3] records the species as "extending inland to Indiana and Missouri."

*BERLANDIERA TOMENTOSA Nutt., var. DEALBATA T. & G. So referred are: *Waterfall* 7038 from prairie alternating with woods, 3 miles west and 2 north of Siloam Springs, Delaware County, June 8, 1947; *Waterfall* 9582, wooded valley, 3 miles south of Kansas, Adair County, July 7, 1950. This material has the pannose tomentum, stems branched at the summit, and leaves whitened with tomentum beneath, with the upper ones becoming deltoid in outline, as described for var. *dealbata* (T. & G., *Flora of North America* 2: 282. 1843; Gray, *Synoptical Flora of North America.* 1 (2): 243. 1886). Torrey and Gray (*l. c.*) cited Nuttall's material from Arkansas and Drummond's from Texas.

*COREOPSIS TINCTORIA Nutt., forma ATROPURPUREA (Hook.) Fern. The form with purplish-brown rays was collected as *Waterfall* 9527, edge of woods, 2 miles north of Ft. Gibson, Cherokee County, June 30, 1950.

*POLYMNIA CANADENSIS L., forma RADIATA (Gray) Fassett. The form with well-developed rays was collected as *Waterfall* 9589, small canyon in mountains, 5 miles northeast of Tahlequah, Cherokee Co., July 7, 1950. All the material seen in this area, where it was fairly common, had well-developed rays.

DEPARTMENT OF BOTANY AND PLANT PATHOLOGY
OKLAHOMA A. & M. COLLEGE, STILLWATER, OKLAHOMA

A GLABROUS VARIETY OF SILPHIUM TEREBINTHINACEUM.—At the close of the Columbus, Ohio meetings of the American Institute of Biological Sciences in September, 1950, the author participated in a two-day field trip planned by the Ecological Society of America in conjunction with the Systematic Section of the Botanical Society of America and the American Society of Plant Taxonomists. Capably conducted by Dr. E. Lucy Braun of the University of Cincinnati and Dr. John N. Wolfe of Ohio State University, the company of botanists was led to various interesting sections of Adams and Hocking counties in unglaciated southern Ohio.

At one of the last stations on the trip scheduled for inspection, Dr. Braun called our attention to an unusual natural prairie in Adams County. Here, among a number of other species, were pointed out many plants of *Silphium terebinthinaceum* in which the upper leaf surface was glabrous. Dr. Braun explained that

[3] Pennell, Francis W. *The Scrophulariaceae of Eastern Temperate North America.* Acad. Nat. Sci. Phil. Monog. 1. 1935.

she had observed such smooth-leaved examples for a period of years, and a stop later at another prairie station verified her belief that this was the common type in the unglaciated section of Ohio and was the same as what she had also found in parts of Kentucky.

Examination of Dr. Braun's collections submitted for study and of additional material preserved in the herbarium of the Chicago Natural History Museum indicates that the plant with the glabrous upper leaf surface may best be described as constituting a new variety. In typical *S. terebinthinaceum* the leaves above are either definitely rough with strumose hairs or the enlarged bases of these hairs persist partly or wholly over the leaf surface. In contrast, the new variety has the leaves above glabrous or completely smooth, and there are no indications of persistent bases of trichomes. The lower surface of the leaves of both typical *S. terebinthinaceum* and the new variety is rough-scabrous and always much rougher than the upper surface.

It is fitting, therefore, in view of Dr. Braun's original observations on these plants, to associate her name with this new variety as

Silphium terebinthinaceum Jacq., var. **Lucy-Brauniae** Steyermark, var. nov., a typo differt laminis foliorum supra glabris.—Type: prairie, north part of Jefferson Top, southeast of Scrub Ridge, 2½ mi. north of Ohio route 348, Adams County, Ohio, August 17, 1950, *E. Lucy Braun* (2 sheets, in herb. E. Lucy Braun).

Other specimens examined: **Ohio**: prairie on limestone, 5.8 mi. north of Jones Corner, Adams County, September 15, 1950, *Steyermark 70564* (herb. Chi. Nat. Hist. Mus.). **Kentucky**: prairie patches on limestone ridge-top, Clack Mountain, Rowan County, May 22, 1937, *E. L. Braun 1460* (herb. E. Lucy Braun); same locality, September 28, 1950, *Braun 4870* (herb. E. Lucy Braun, herb. Chi. Nat. Hist. Mus.); ridge crest, south of Peach Grove, Pendelton County, July 8, 1941, *Braun 4036* (herb. E. Lucy Braun). **Mississippi**: Agricultural College, Oktibbeha County, August 11–17, 1896, *C. L. Pollard 1332* (herb. Chi. Nat. Hist. Mus.). **Illinois**: Lord's Park, vicinity of Elgin, July 29, 1917, *C. Gronemann 44* (herb. Chi. Nat. Hist. Mus.).

Harper 3812 from Calhoun County, Alabama, and *Ruth* s. n. from Knoxville, Tennessee (both specimens in herb. Chi. Nat. Hist. Mus.) have the upper leaf surface apparently smooth and glabrous, but closer examination reveals some of the enlarged white basal portion of the hair still persisting on the surface.

In the *Steyermark* specimen from Ohio, it was noted that the rays were shorter, the heads smaller, and the plant itself of smaller

stature compared with typical *S. terebinthinaceum*, but these differences have not been correlated in other material examined. Apparently, there is considerable variation in typical *S. terebinthinaceum* as to height of plant, size of leaves, size of heads, and length of ray flowers.—JULIAN A. STEYERMARK, Chicago Natural History Museum, Chicago, Illinois

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PELTANDRA VIRGINICA IN WELLAND COUNTY, ONTARIO.—*Peltandra virginica* (L.) Schott & Endl., the Virginian Arrow Arum has long been considered a rare plant in Ontario. Macoun, in his Catalogue of Canadian Plants, published in 1888 made reference to this fact. In describing its occurrence ". . . in a marsh about a mile beyond 'The Ferry' Prince Edward County, near Belleville, Ontario . . ." he implied that this was the only location known to him at that time. Soper, in his Preliminary Checklist of Plants in Ontario South of the Canadian Shield, published in May, 1949, indicates that Macoun's record for *Peltandra virginica* stands alone for this Province, and further emphasizes the rarity of this species by suggesting the possibility that it may be extinct in Ontario, since no recent records have come from the only known station in the Belleville area.

In 1949 considerable interest was aroused when it became known that specimens of *Peltandra virginica* were included in plant collections submitted to McMaster University by Mr. Bert Miller, naturalist of Fort Erie, who was engaged in collecting in Welland Co., Ontario during the summer of 1948. These activities were part of a project involving extensive floral studies in the counties bordering the eastern portion of Lake Erie, initiated by the Department of Botany and assisted financially through a grant from the Ontario Council of Research.

According to Gray's Manual of Botany, 8th edition, 1950, *Peltandra virginica* is widely distributed in the United States, including neighboring New York State, hence it is not surprising that it should be found in portions of Southern Ontario. This new record for Welland County, however, is particularly interesting, since after careful searching it has been found in this one specific area only—near the mouth of one of the sluggish streams flowing into Niagara River between Niagara Falls and Fort

Erie. The plants have formed dense clumps from two to four feet in diameter in shallow water and are distributed frequently throughout about one quarter of a mile of the length of the stream at this point. Plants do not occur either above or below this specific area.

The heavy foliage and slender inflorescences are carried well above the surface of the water. The tightly rolled spathe with pale undulate margin enclosing the whitish spadix with staminate flowers extending to the tip, agrees with Fernald's description published in Rhodora, Vol. 50: 591, March 1948. The dark green berries which are submerged at maturity because of the recurving habit of the fruiting scape, were collected in September, 1950, but on later examination on October 17th, no fruits were found in any of the inflorescences which could be reached. The spathes which had become considerably distended appeared to have been torn open, suggesting that some form of wildlife may have attacked them and removed the fruits. In literature pertaining to natural aquatic food for waterfowl it is indicated that the fruits of this plant, commonly called "Wampee" or "Duck Corn" are occasionally found in the crops of wood ducks. This lends support to the above, that the fruits may have been utilized for food.

To investigate the biology of this plant and to further explore its potentialities as a natural food for waterfowl, it has been successfully introduced under control, into the aquatic plant nursery in Cootes Paradise Marsh by the Royal Botanical Gardens, Hamilton.—L. Laking, McMaster University & Royal Botanical Gardens, Hamilton, Ontario, Canada.

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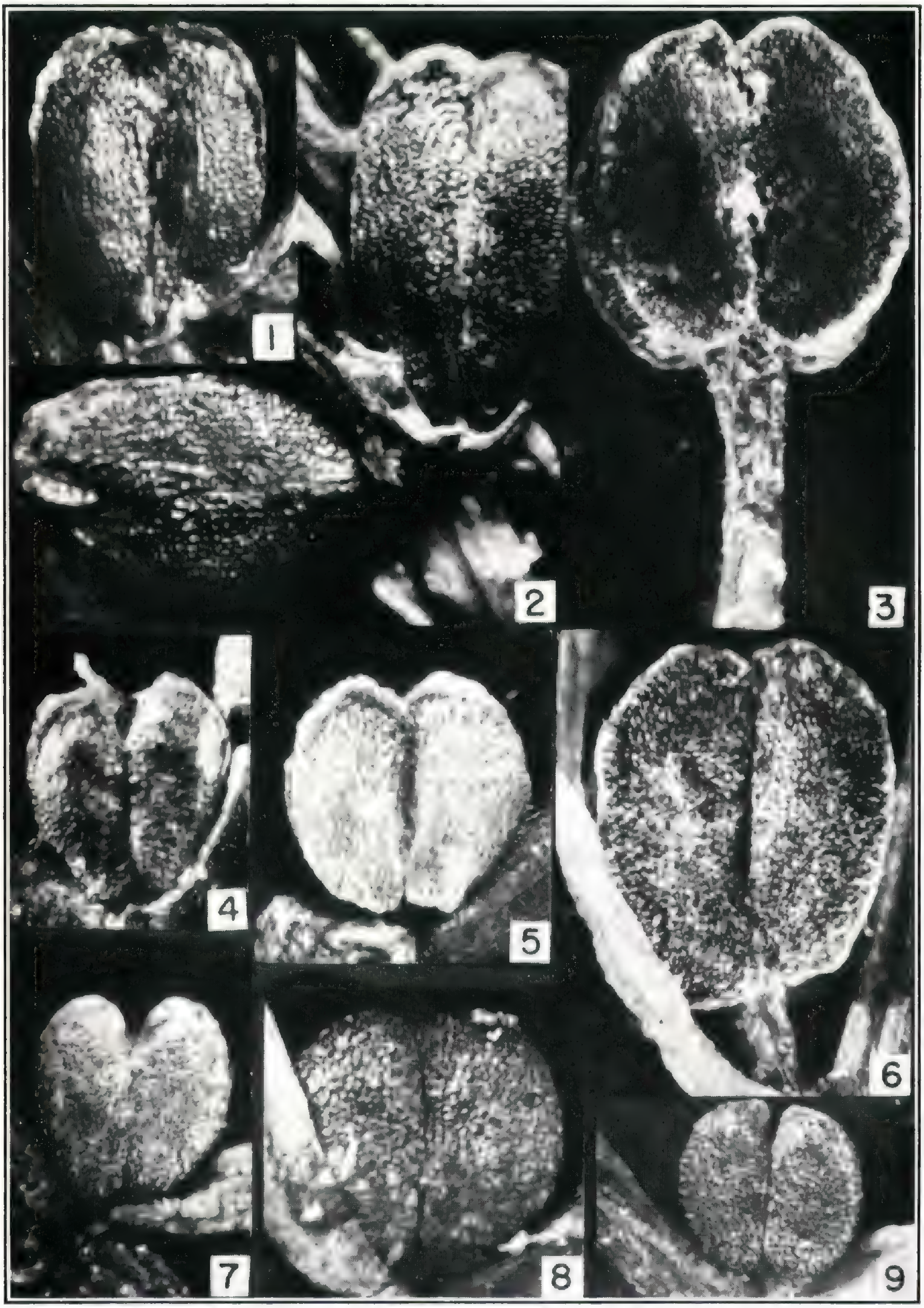

Photos by Langdon Divers

FRUITS OF CALLITRICHE

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CALLITRICHE IN THE NEW WORLD

NORMAN C. FASSETT

THIS treatment of the species of *Callitriche* occurring in the Western Hemisphere, from Alaska and Greenland to Cape Horn, was started in the summer of 1945 while the writer was working at the Smithsonian Institution under a grant from the Wisconsin Alumni Research Foundation. Continued study has been made possible by the generous loans of material from many herbaria, including: Gray Herbarium (GH); Missouri Botanical Garden (MO); New York Botanical Garden (NY); United States National Herbarium (US); University of California (UC); Universidad Nacional de La Plata (LP); Instituto de Botanica, São Paulo (SP); Chicago Museum of Natural History (CM); New England Botanical Club (NEBC); Oberlin College (OB); University of West Virginia (WVA); University of Tennessee (TENN); University of Georgia (GA); herbarium of Mr. R. F. Thorne; University of Wisconsin (WIS).

For assistance in the interpretation of the morphology of various structures, I am indebted to my colleagues, Professors Emma L. Fisk and Richard I. Evans, and to Professor Arthur J. Eames.

Ranges are plotted on outline maps copyrighted by McKnight

PLATE 1167

Fruits are shown 64 times natural size. Photographs by Langdon Divers.
Fig. 1. *C. verna.* Quebec, *Fassett 27795* (WIS). Fig. 2. *C. verna.* Colorado, *Mackenzie 359* (MO). Fig. 3. *C. longipedunculata.* California, *Hoover 776* (UC). Fig. 4. *C. heterophylla.* Tennessee, *Svenson 10151* (WIS). Fig. 5. *C. heterophylla.* New Jersey, *Adams 298* (GH). Fig. 6. *C. longipedunculata.* California, *Mason 5193* (UC). Fig. 7. *C. heterophylla.* Massachusetts, *Harper* (WIS). Fig. 8. *C. heterophylla* var. *Bolanderi.* Washington, *Muenscher 9949* (WIS). Fig. 9. *C. heterophylla.* Illinois, *Schneiders* in 1893 (WIS).

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The taxonomy of *Callitriche* is difficult. Most species are polymorphic (see Plate 1168, with 10 individuals of one species), and individuals of very similar form may be found in different species. Fruit is therefore necessary for identification in all cases. While fruits are present on a majority of collections, they are often evident only after considerable search with a low power binocular microscope. Most fruits are a millimeter or less in diameter so that close inspection is necessary to see the minute characters used to differentiate species. Magnification of at least 20 times is necessary, and 30 times is often better. Size and proportions of fruit, presence or absence of wings, nature of the commissural groove as shown in a cross-section, and sometimes the surface markings of the mericarps account for most of the key characters.

The nomenclature of *Callitriche* is difficult. Nearly every early name was based entirely on foliage characters that are paralleled in many species. Most of these names are, therefore, *nomina ambigua*, and their list includes some of the best-known in the genus: *C. verna*, *C. palustris*, *C. heterophylla*, *C. autumnalis*, *C. hermaphroditica*, *C. stagnalis*, *C. turfosa*, and *C. terrestris*. It has therefore been necessary to fix the applications of these names (in absence of type specimens) by the usage of the first writer to describe the fruit. Happily, this does not result in any major upsets in nomenclature. *C. terrestris* Raf., interpreted by Torrey in 1826, replaces *C. Austini* of American literature, described in 1867 (and based incidentally on a mixture of 3 species). *C. palustris*, used by most recent American authors, gives way to *C. verna*, the traditional name in European literature; both names were used in an idefinite sense by Linnaeus, and *C. verna* was first precisely interpreted in 1831, *C. palustris* not until 1897 in Britton & Brown's Illustrated Flora.

Structure of the Fruit of Callitriche

Several fruits are illustrated, natural size, in Fig. 3, 5, 7, 8 and 9 on Plate 1169, where they appear as round dots about a millimeter in diameter in the leaf-axils. Enlarged photographs are shown in Plate 1167.

The fruit of *Callitriche* consists of 2 carpels, each of which is divided into 2 one-seeded mericarps (Fig. 1b). The orientation of the two stigmas, as shown in Fig. 4a and 5a, suggests that the true partition between carpels is the one lying horizontally in Fig. 4c, so that in a face view of the fruit, like Fig. 3b, only one carpel is visible. The false partition then appears as a facial groove, visible as a straight line up and down the middle of the fruit, in Fig. 2b, 3b, 4b, 5b. The commissural groove, or groove between carpels, appears only when the fruit is viewed from one edge, as in Fig. 11b, 12b, etc., or is seen in cross-section when the two commissural grooves appear at the two ends as in Fig. 1b, 2c, 3c, and 4c.

The surface of the mericarps appears reticulate on the dried fruits. Plate 1167 shows photographs of dried fruits. Fig. 3d, 4d, 13d, 13i, 13v, etc., are camera lucida drawings of pericarps stripped from fruits that have been cleared by boiling in KOH. The actual nature of the reticulate surface is shown in Fig. 13q, a portion of a section made by my colleague, Professor Richard I. Evans, from fresh material. The drawing shows, starting at the outside (the top in the drawing): the pericarp, consisting of 2 or 3 layers of very thin-walled cells and a layer of cells with all but the outer wall thickened; the seed-coat, a single layer of very thin cells; the endosperm, of large oval loosely packed cells; and the embryo, of smaller, conspicuously nucleated cells. The reticulate appearance is due to the collapse of the outer thin-walled cells of the pericarp, so that under the microscope one looks into the cavities of the thick-walled cells.

A fresh fruit just out of the water, viewed with a binocular microscope of 20–30 power, has a remarkable appearance. The lines between the thick-walled cells show as threads of shining silver. There must be a capillary but continuous and branched intercellular space, filled with air, between these cells.

The wings may be of two types. The true wing is a membranous outgrowth from the margin of the carpel (Fig. 4b, 4c) and is of a different texture and has different markings from the reticulate body of the carpel. The wing may have heavy radial markings as in Fig. 3d, 4d, or almost no markings as in Fig. 10v, 23b. There is sometimes present what may be called a false wing. This is best developed in *C. hermaphroditica*, a species usually

described as having a broad-winged fruit. Fig. 24d shows such a fruit; the true wing is very narrow, and the false wing (shaded with a few radial lines) is broad. The false wing is formed, apparently, by the uninflated outer part of the carpel, marked III in Fig. 24c. The nature of the false wing is also shown in Fig. 24b, where it is very conspicuous and no true wing is shown. This contrasts with Fig. 23e which shows the knife-like appearance of the true wing in cross-section. Fig. 24f is a camera lucida drawing of the edge of the carpel of *C. hermaphroditica*, and it shows the very narrow true wing to the right, and the surface of the false wing marked like the ordinary carpel wall.

Some development of a false wing due to incomplete filling of the mericarps by the seeds is shown in Fig. 4 & 5 on Plate 1167.

Morphology and Cytology

Professor A. J. Eames sends me the following notes on the morphology of the fruit of *Callitriche:*

"There are, as usually described, two carpels each with two marginal ovules. The carpels are flattened dorso-ventrally so that the midrib (with dorsal bundle) lies close to the placental margins. The dorsal (midrib) bundle rarely shows and then only as one xylem element. The ventral or marginal bundles, though weak, are definite. There are the normal two for each carpel. Thus the axile placentation shows a flattened ring of four bundles, a normal condition for axile placentation with two carpels.

"Even in flower the midrib region of each carpel extends ventrally almost to the placenta. Later it apparently extends farther, reaching, with this false partition, the placenta, dividing the locule and separating the two ovules.

"In the mature fruit, dehiscence is through this false partition and the placental region of each carpel. Also the two carpels separate. This morphological condition is closely like that in the mints, and borages.

"The styles stand in normal position over the midribs of the carpels; the stigma is therefore not commissural."

The haploid chromosome number in the Sect. Pseudocallitriche is 3; in Sect. Callitriche it is 5 in some species, 10 in others, and rarely 19 or 20. This is according to Jorgensen,[1] who also

[1] Bot. Tidskrift 38: 81–122. 1923.

describes the development of the gametophytes and discusses the systematic position of the genus.

Some Techniques in Handling Small Seeds and Fruits

Small fruits like those of *Callitriche* are difficult to work with. First, a fruit must be located on the sheet. This is best done with a low power binocular microscope, after which an arrow may be marked on the sheet for future guidance, or, better still, a pencil line may be drawn leading among the stems and leaves to the fruit. It is still difficult to compare fruits from two sheets. For this purpose, the most successful technique involves use of a slide of cellulose acetate, perhaps 1 x 1½ inches. The fruit is removed from the plant and placed on the slide; a single drop of acetone will make it adhere to the acetate. Now, the slide can be superimposed on any specimen; it is transparent and a fruit lying below it can easily be compared with the one fastened to it.

Cross-sections of fruits are often necessary (Fig. 1b). A fruit is laid on the acetate slide, and wetted with a drop of acetone. Before the acetone has dried, a drop of a thin solution of cellulose acetate is put on, to imbed the fruit. When this has hardened, two parallel cuts through the middle of the fruit (performed with a razor blade under the binocular) makes a section that can be freed by another cut under the whole fruit. The section is laid flat, and secured by a drop of acetone. If the fruit is sectioned without imbedding the mericarps usually separate.

To determine the nature of the commissural groove an edge view of the fruit is often useful (Figs. 10c, 10f, etc.). The fruit is laid on the cellulose acetate slide and, under a binocular microscope cut lengthwise along the facial groove. Each half-fruit is put in an upright position (the cut surface against the slide) and secured in place with a drop of acetone. Since these pieces are easily knocked off, they may be protected by small pieces of cellulose acetate placed on each side of the preparation and fastened down with a drop of acetone.

For microscopic examination of wings and surface of carpels (Figs. 1c, 3d, 4d) the fruits are boiled in KOH, then washed in water. Each mericarp (the fruit will usually have fragmented by this time) is dissected while still wet, either by squeezing out the seed (under the binocular) or by stripping off the pericarp.

The pericarps are moved to a drop of alcohol on the slide, for dehydration. They are removed from the alcohol and covered with a drop of acetone, another small piece of cellulose acetate is put on for a cover, and the preparation pressed together for a few seconds. The mount is then permanent.

For many collections of *Callitriche*, slides have been prepared in this fashion, showing a fruit in face view, in edge view, and in section, with a piece of pericarp and wing for microscopic examination. These slides appear to be permanent and are being placed in envelopes on the herbarium sheets. I can only hope that they may keep as well as have the meticulously prepared dissections by Dr. Engelmann, which it has been my privilege to examine in the collections of the Missouri Botanical Garden.

These techniques have been described in some detail because they proved to save so much time once they were developed. They may be easily adapted for use in other groups. Seeds and other small objects may be readily mounted on acetate slides, usually with a single drop of acetone that dries in a few seconds. Flowers and other objects that have been boiled for softening and dissection must be dehydrated before being stuck down with acetone; this is readily accomplished by running a small stream of alcohol over the preparation. The slides are easily marked with India ink and may be labelled with collector's name and number, etc., for identification.

For quick repairs to herbarium sheets, cellulose acetate is invaluable. This is particularly true in the case of *Callitriche*, and for other aquatics that have only been floated out on the sheet without adhesive. A very thin solution of cellulose acetate in acetone is used; painted thinly across a specimen or dotted on locally, it secures the plant to the paper, dries in a few minutes, and is visible only with the most careful scrutiny.

The Sections of Callitriche

Sect. 1. Microcallitriche sect. nov., plantae palustres vel subterrestres; foliis subuniformibus; foliorum pilis peltatis nullis aut raris; floribus sin bracteis; antheribus 0.1–0.2 mm. latis; staminibus 0.2–1.2 mm. longis; stigmatibus 0.2–1.2 mm. longis; fructibus plerumque latioris quam longis.—Species Typica, *C. deflexa* R. Br.

Section *Microcallitriche* is best developed from southern and extreme western United States southward to Argentina; a few

species are found in Japan, Australia and New Zealand. These are the most nearly terrestrial species of *Callitriche*, and several kinds grow where the soil is only somewhat muddy in the spring and becomes desiccated as the season progresses.

Sect. 2. CALLITRICHE. *Eucallitriche* Hegelm. Monogr. Gattung *Callitriche* 54, 1864, emended. Plants aquatic or in mud at the water's edge; most species highly polymorphic, amphibious and adaptable to various depths of water or muddy shores; submerged leaves typically linear, 1-nerved, bidentate at tip, but sometimes obovate and petioled; floating leaves typically obovate, 3–5-nerved, and narrowed to a flat petiole; leaves with peltate scales (Figs. 17c, 17d) that are 4-, 8-, or 16-parted; flowers subtended by two white inflated bracts; anthers 0.2–1.5 mm. wide; stamens elongating to 1.5–3 mm.; styles 0.7–6 mm. long; length of fruit usually equalling or exceeding the width.—As TYPE SPECIES may be named *C. verna* L. emend. Kütz. (*C. palustris* of many American authors).

Section *Callitriche* stands in many respects intermediate between the other two sections. Its members may sometimes be found intermixed with those of one of the other sections. When well submersed its representatives may have only linear leaves and simulate Sect. 3, but when stranded on a muddy shore the same species may be turf-like with only broad leaves to simulate Sect. 1. A single clone may grow partly on the shore and partly in the water and exhibit both life forms at the same time. A very common phase has the lower leaves linear, while the upper ones are broad and crowded in a rosette floating on the surface; these floating rosettes give the common name "Water Starwort." Such plants often show these rosettes much better in their own habitat than on herbarium sheets. Members of this group are found on all continents.

Sect. 3. PSEUDOCALLITRICHE Hegelm. Mongr. Gattung Callitriche 61. 1864. Plants always submersed; leaves uniform, dark metallic green, often with a slightly darker margin, without peltate scales, nearly linear but actually widest at base, rounded to the bases which are sometimes slightly fused but are not connected by a membranous wing, gradually tapered to the bidentate apex; flowers without bracts; surface of fruit obscurely and irregularly pitted; fruit with a broad false wing and a narrow true wing.—As TYPE SPECIES may be named *C. hermaphroditica* L. (*C. autumnalis* Hegelm., l. c.).

Section *Pseudocallitriche* represents the most aquatic extreme of the genus. Its members occur in cool water throughout Europe and in northern North America.

Key to Species of Callitriche in the Western Hemisphere

a. Leaves bright green, of various shapes, the linear 1-nerved ones tapering to a clasping base (Fig. 10w); nodes with a narrow membranous wing connecting the leaf-bases (Fig. 1a, 2a, 3a, 4a, 5a, 7a, 9a, 10g, 10p, 10w, 15b, 16e); surface of fruit usually sharply reticulate.

b. Fruit broader than high (Figs. 1–7) except in *C. occidentalis* (Fig. 8); stigmas 0.3–1 mm. long (Fig. 1a, 3b, 7a); stamens 0.2–1.2 mm. long and not elongating as the fruit develops; anthers 0.1–0.2 mm. wide; flowers without bracts; leaves and stems mostly without peltate scales; leaves essentially uniform, narrowly oblong (Fig. 5a), or spatulate (Fig. 4a), or broadly oblanceolate (Fig. 1a), 1-3-nerved (often obscurely so); plants mostly terrestrial or on wet mud. Sect. 1. Microcallitriche.

c. Fruit 0.5–1.2 mm. wide, not gibbous at base.

d. Width of fruit exceeding the height by 0.1 mm. (Fig. 1a); face of mericarps convex (Fig. 1b) .... 1. ***C. turfosa.***

d. Width of fruit exceeding the height by 0.2 mm.; face of mericarps nearly flat (Fig. 2c).

e. Wing, or margin of carpels, spreading.

f. Fruit 0.9 mm. or less wide, pedicelled or sessile; wing 0.08 mm. or less wide.

g. Margin of carpels with a definite scarious wing 0.03–0.08 mm. wide, under high magnification appearing with radial extensions from the brown reticulations on the face of the carpel, these extensions branching and anastomosing (Fig. 2d); stigmas loosely ascending (Fig. 2b), often caducous; leaves 3-veined, the midrib and often the lateral veins evident (Fig. 2a) .... 2. ***C. deflexa.***

g. Margin of carpels appearing as if not winged but under high magnification showing a wing 0.01–0.03 mm. wide, the radial extensions of the brown reticulations from the face of the carpel simple or forking, not anastomosing (Fig. 3d); styles usually deflexed (Fig. 3b); leaves 3-veined but the veins very obscure (Fig. 3a) .... 3. ***C. terrestris.***

f. Fruit 0.8–1.2 mm. wide, pedicelled (Fig. 4a); wing usually 0.1 mm. or more wide (Fig. 4b).

h. Leaves spatulate, the upper 0.8–2 mm. wide, 3-nerved (Fig. 4a); wing of fruit 0.1–0.2 mm. wide .... 4. ***C. marginata.***

h. Leaves linear, 0.6 mm. or less wide, 1-nerved or with nearly obsolete lateral veins (Fig. 5a); wing of fruit nearly obsolete .... 5. ***C. sepulta.***

e. Wing and thin margin of carpel turned outward at right angles to the surface of the fruit or revolute and appearing like a thickened margin (Fig. 6a, 6b) .... 6. ***C. Nuttallii.***

c. Fruit 0.3–0.8 mm. wide, more or less gibbous at base (Fig. 7a).

i. Fruit 0.5–0.8 mm. wide, not quite so high (Fig. 7a, 7b, 7c) .... 7. ***C. peploides.***

i. Fruit 0.3–0.4 mm. wide, about as high (Fig. 8)... 8. ***C. occidentalis.***

b. Fruit as high as wide or a little higher, rarely slightly wider than high; stigmas 0.7–6 mm. long (Fig. 10g, 12g, 15b, 16h); stamens elongating as the fruit matures, to 1.5–3 mm.; anthers 0.3–1.5 mm. wide; flowers with 2 whitish inflated bracts at base (Fig. 10g, Fig. 2 on Plate 1167); leaves and upper nodes usually with peltate scales (Fig. 9a, 13Ad, 17c, 17d, 23j, 23k); plants amphibious, growing entirely submersed or with a terminal rosette of floating leaves, or as a mat stranded on the mud; leaves of various types on different plants or on the same plant (Figures on Plate 1168). Sect. 2. Callitriche.

j. Leaves succulent, connate at base to make a cup about 0.5 mm. deep (Fig. 9a); stems firm and opaque, appearing homogeneous when pressed . . . . 9. *C. antarctica.*

j. Leaves thin and membranous, connected at base by a very narrow wing; stems weak, pressing flat and membranous except for the firmer stele.

k. Fruit rarely more than 1.2 mm. wide (–1.5 mm. in a South American species); wing of fruit, if present, sharply demarked from the reticulate face of the mericarp; reticulations, when seen under high power, dark brown or orange, and, under low power (10–30 × magnification) appearing clear and distinct.

l. Wings of fruit, if present, only on the outside of the mericarps and extending slightly or not at all around the base or summit to the facial groove (Fig. 10a, 18a, 19c, 20c, 21b).

m. Carpels more broadly rounded toward the summit than toward the base, so that the fruit is slightly heart-shaped (Fig. 10a, 11a, 13e, 13Am, Fig. 1 & 5 on Plate 1167); wing, if present, broadest at the summit of carpels (Fig. 1 on Plate 1167).

n. Fruit 0.6–1.3 mm. wide.

o. Height of fruit exceeding the width by 0.2 mm. (many fig. on Plate 1172); surface of mericarps with reticulations tending to run in vertical rows (Fig. 1 & 2 on Plate 1167); lower end of mericarps curved outward so that the fruit is thickest at base (Fig. 10c, 10k, 10u) . . . . 10. *C. verna.*

o. Height of fruit equalling width (Fig. 12a, 12c, 13a, 13Ae), or height 0.1 mm. greater (Fig. 11a, 13d, 13Aa, 13Ap) or less (Fig. 13e, 13m) than width; reticulation of mericarps usually not at all in vertical rows (Fig. 4, 5, 7 on Plate 1167); lower end of mericarps straight so that fruit is thickest a little below the middle (Fig. 11b, 12b, 13f, 13Ab).

p. Commissural grooves wide (Fig. 11b, 11c); fruit 1.1–1.5 mm. high.

q. Fruit with well-differentiated white wings at summit (Fig. 11a); commissural grooves slightly U-shaped . . . 11. *C. albomarginata.*

q. Fruit wingless or with an obscure suggestion of wings; commissural grooves V-shaped . . . . 12. *C. heteropoda.*

p. Commissural grooves very narrow or edges of carpels in close contact (Fig. 13c, 13g, 13l, 13Ac, 13Af); fruit 0.6–1.2 mm. high ....13. *C. heterophylla.*

n. Fruit 1.5 mm. wide..................14. *C. quindiensis.*

m. Carpels equally rounded above and below (Fig. 15b, 16b, 17a, 18a, 21b), or some fruits narrowed toward base on a South American species with conspicuous wings (Fig. 18k); wing, when present, of equal width around the carpel (Fig. 18d, 19c, 21b).

r. Width of fruit equalling (Fig. 15b, 17a) or exceeding (Fig. 17e, 18a) the height, or fruit not more than 0.1 mm. higher than wide; fruit sessile except in a variety of *C. Lechleri.*

s. Stigmas sharply reflexed (Fig. 15b), usually persistent.........................15. *C. hamulata.*

s. Stigmas erect or ascending, often caducous.

t. Carpels wingless

u. Edges of carpels rounded, with almost no commissural groove (Fig. 16a)......16. *C. anceps.*

u. Edges of carpels angled, with a wide V-shaped commissural groove (Fig. 17b) .... 17. *C. nubigena.*

t. Carpels winged.

v. Commissural groove deep and V-shaped (Fig. 18c, 18f); fruit slightly wider than high (Fig. 18d), often pedicelled ....18. *C. Lechleri.*

v. Commissural groove shallow and U-shaped (Fig. 19a); fruit almost exactly as high as wide (Fig. 19c), always sessile..........................19. *C. trochlearis.*

r. Width of fruit less than the height by about 0.1 mm. (Fig. 20c, 21b); fruit pedicelled.

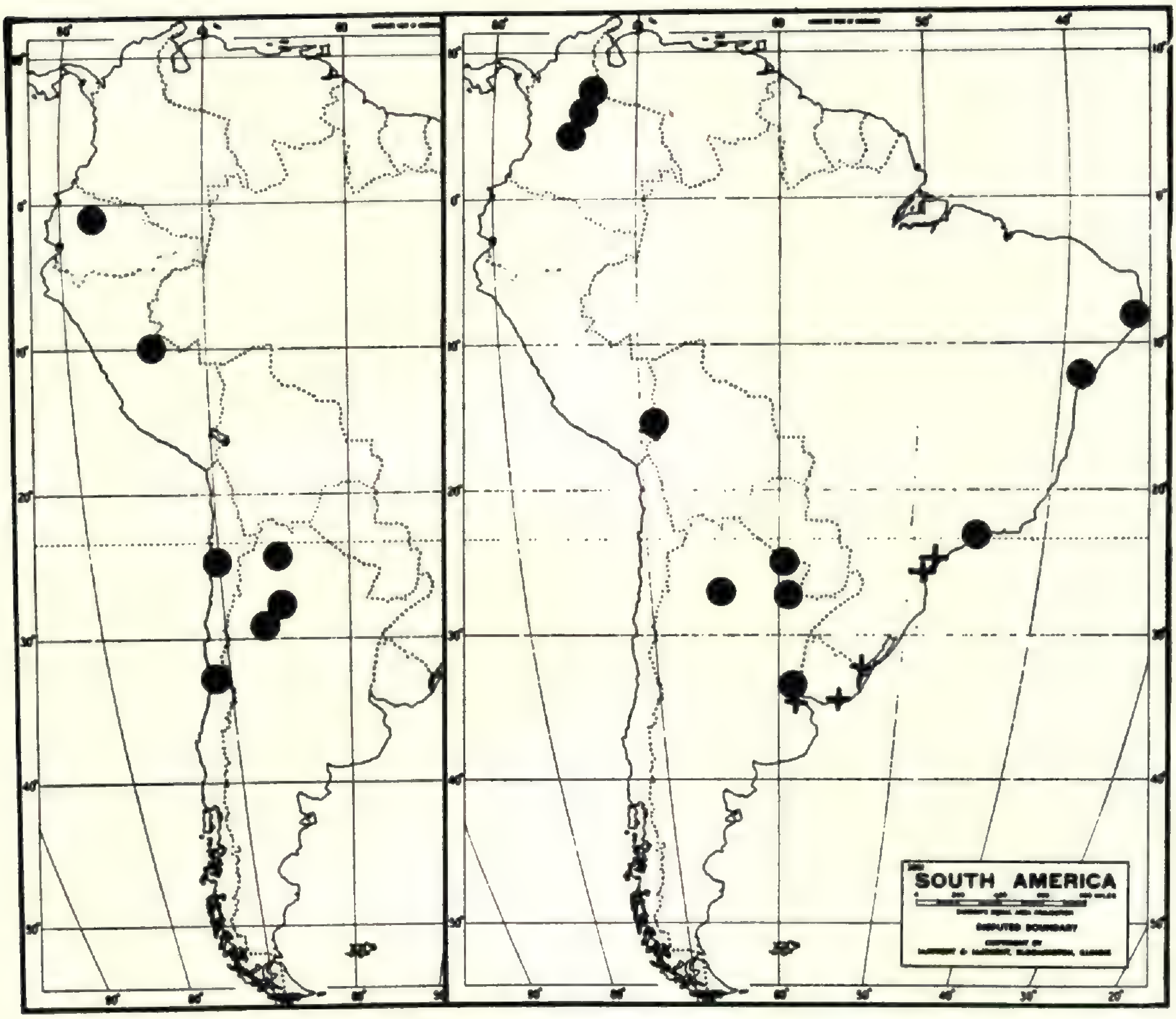
w. Fruit 0.8–0.9 mm. high, clearly reticulate on the faces, with an obscure wing on the outer margins of the mericarps (Fig. 20c).20. *C. oblongicarpa.*

w. Fruit 1.0–1.4 mm. high, nearly black at maturity, obscurely reticulate on the faces, with a clearly defined wing around the outer margin of the carpels and extending slightly around the base of each mericarp (Fig. 21b)..................21. *C. longipedunculata.*

l. Wing of fruit extending well around the base and apex of each mericarp so that the facial groove is very short (Fig. 22b).......................22. *C. rimosa.*

k. Fruit 1.2–1.7 mm. wide; wing usually conspicuous but not usually clearly demarked from the reticulate faces of the mericarps; reticulations, when seen under high power, very pale, and, under low power, appearing rather obscure.......................23. *C. stagnalis.*

a. Leaves dark metallic green, all submersed, linear-lanceolate (Fig. 24j), narrowed to a clasping base, the bases not connected by a wing; faces of mericarps obscurely and irregularly pitted; plants strictly aquatic. Sect. 3. PSEUDOCALLITRICHE...............................24. *C. hermaphroditica.*



1 (left). *C. turfosa.* 2 (right). *C. deflexa* var. *deflexa* (crosses), and var. *subsessilis* (dots) in South America.

1. **C. turfosa** Bert. emend. Hegelm. *C. turfosa* Bert. Amer. Journ. Sci. 19: 308. 1831, *nomen nudum;* Hegelm. Monographie Gattung Callitriche 59. 1864, in part; Hegelm. Verhandl. Bot. Ver. Brandenburg 9: 13. 1867.—Fruit 0.7–0.9 mm. wide, 0.6–0.8 mm. high, very narrowly winged all around (Fig. 1a), sessile or on peduncles up to 0.4 mm. long; mericarps plump, thinner toward the margins (Fig. 1b); stigmas 0.5–1.0 mm. long, loosely ascending, caducous or persistent; stamens 1 mm. or less long; anthers about 0.2 mm. wide; leaves essentially uniform, 2–4 mm. long, 0.75–1.5 mm. wide, 3-nerved.—On damp soil and in shallow water; Ecuador to northern Chile and eastern Argentina.—**Ecuador:** in Andibus Ecuadorensibus, 1857–9, *Spruce 5053* (GH, MO, NY). **Chile:** Dept. Junín, Carpapata above Huacapistana, 2700–3200 m., June 7, 1929, *Killip & Smith 24386* (US); Agua Dulce, lat. 25° 16′ S, Prov. Antofagasta, Dept. Taltal, Nov. 28, 1925, *Johnston 5187* (GH, US); Cechinalcito, Taltal, Nov. 11, 1936, *Montero 2974* (GH); Valparaiso, 1895, *Buchtien* (US). **Argentina:** Dept. Leales, Oct. 5, 1919, *Venturi 482* (US, GH); Dept. Capital, Rio Salé, Sept. 28, 1923, *Venturi 2066* (US); Prov. Jujuy, Dept. Capital, Rio Zapala, 1250 m., Oct. 3, 1938, *Eyerdam & Beetle 26315* (MO, GH, UC); Bosque de la Plata, prov. de Buenos Aires, Nov. 28, 1932, *Cabrera 2247* (LP).

According to Hegelmaier, 1867, *C. turfosa* as originally conceived (but not described) by Bertero, consisted of two entities, treated by Hegelmaier under the names *C. turfosa* and *C. marginata γ Lechleri.* Each of these is cited by Hegelmaier from Rancagua and Quillota, Chile, collected by Bertero. The only cited collection available to the present writer that can be definitely associated with *C. turfosa* is *Spruce 5053* from Ecuador which was not actually seen by Hegelmaier but included on the authority of Engelmann. The best clue afforded by the descriptions to the application of names to these two Andean species is in relative size of fruit: "Frucht gross" in *C. marginata*, including *γ Lechleri*, and "Frucht klein" in *C. turfosa.* The fruits of what is here recognized as *C. turfosa* are 0.7–0.9 mm. wide, while those of *C. Lechleri* are 1.0–1.4 mm. wide.

2. **C. deflexa** A. Br. ex Hegelm. Monogr. Callit. 58, t. 3. 1864; Hegelm. in Martius, Fl. Bras. 13, pt. 2. col. 13. 1882.

Fruit 0.5–0.9 mm. wide, 0.3–0.7 mm. high, sessile or on pedicels up to 4 mm. long; wings usually 0.03–0.08 mm. wide, nearly uniform around the fruit (Fig. 2b), with radial markings produced by the greatly anastomosing extensions of the markings from the faces of the carpels; stigmas 0.3–0.4 mm. long, irregularly erect or occasionally somewhat recurved, often caducous; anthers 0.1–0.2 mm. long, on filaments 0.2–0.5 mm. long (Fig. 2a); leaves 2–4 mm. long, 0.8–2.3 mm. wide, the midrib and often the two lateral veins evident.—Mexico to Argentina.

As first described in 1864, *C. deflexa* included plants with pedicelled fruits and those with sessile fruits, North American as well as South American. The specific name probably came from the deflexed stigmas of the North American component (here separated as another species), but the Brazilian plant with long

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Plate 1168

All figures are *C. heterophylla*, and are natural size, made by direct photographic prints from the pressed plants. All collections are in the Gray Herbarium.

Fig. 1. Virginia, *Fernald & Long 9969*. Fig. 2. New Jersey, *Bartram* in 1917. Fig. 3. New York, *House 20174*. Fig. 4. Rhode Island, *Reynolds 068*. Fig. 5. New York, *Raup 7697*. Fig. 6. Maryland, *Smith* in 1881. Fig. 7. New York, *Raup 7794*. Fig. 8. Virginia, *Fernald & Long 9970*. Fig. 9. Connecticut, *Andrews* in 1895. Fig. 10. Massachusetts, "Local Collection" in 1895.

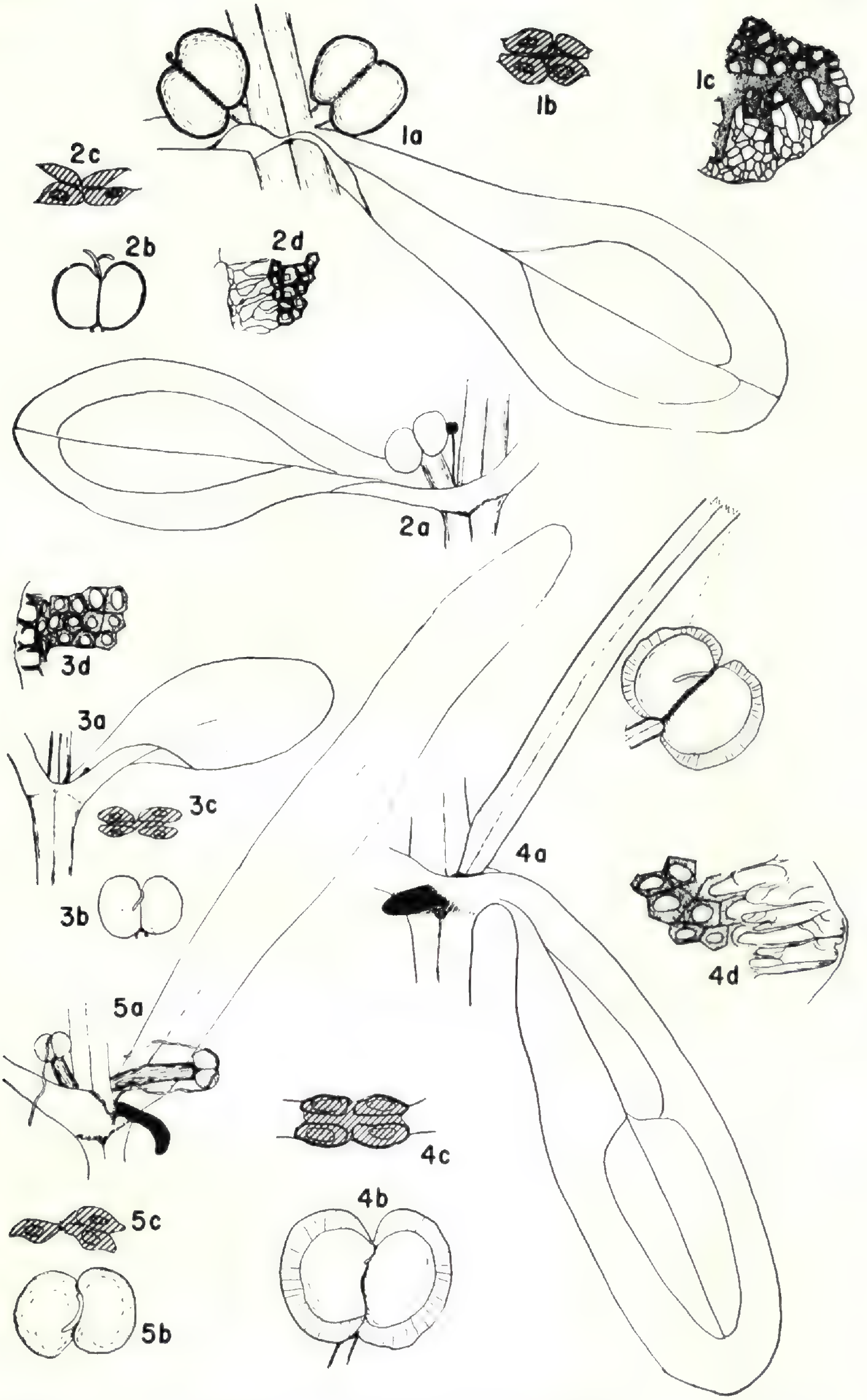
Plate 1169

All figures are natural size, made by direct photographic prints from the pressed plants. All collections are in the Gray Herbarium.

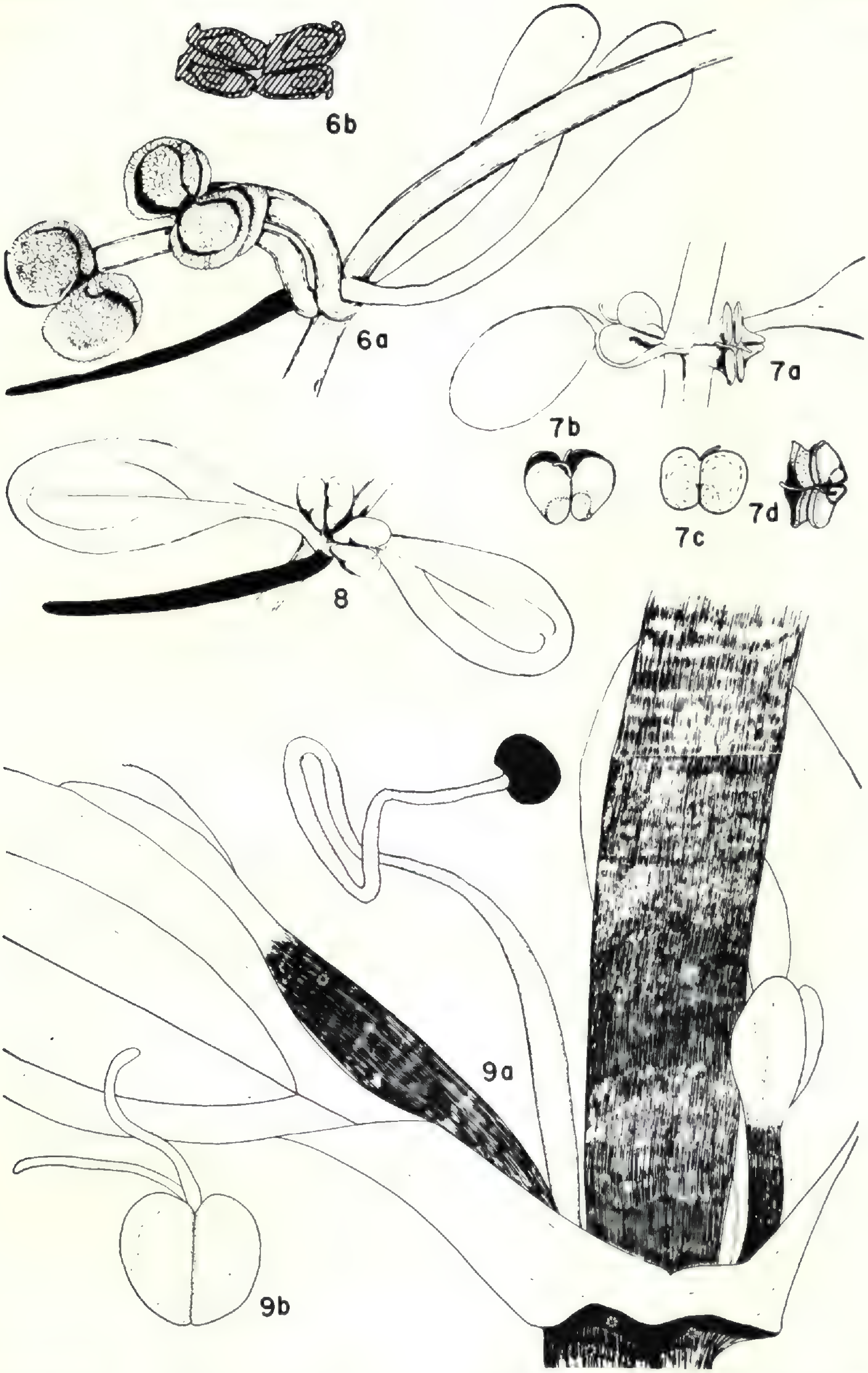
Fig. 1. *C. anceps.* Labrador, *Fernald, Wiegand & Long 28640*. Fig. 2. *C. anceps.* Labrador, *Fernald & Wiegand 3649*. Fig. 3. *C. anceps.* Newfoundland, *Fernald & Wiegand 3657*. Fig. 4. *C. anceps.* Newfoundland, *Robinson & Schrenk* in 1884. Fig. 5. *C. anceps.* Newfoundland, *Gilbert & Hotchkiss 28638*. Fig. 6. *C. anceps.* Quebec, *Victorin, Rolland & Jacques 33330*. Fig. 7. *C. anceps.* Quebec, *Fernald & Collins 234* (Type). Fig. 8. *C. anceps.* Georgia, *Svenson 7507*. Fig. 9. *C. anceps.* Quebec, *Fernald & Smith 25879*. Fig. 10. *C. turfosa.* Chile, *Johnston 5187*. Fig. 11. *C. antarctica.* Marion Island, *Mosley*. Fig. 12. *C. marginata.* California, *Mason 6810*. Fig. 13. *C. deflexa.* Brazil, *Rudio* (Isotype). Fig. 14. *C. sepulta.* Oregon, *Hall 459* (Type).

Callitriche heterophylla

Callitriche. 1–9, C. anceps. 10, C. turfosa. 11, C. antarctica. 12, C. marginata. 13, C. deflexa. 14, C. sepulta.



CALLITRICHE. 1, C. TURFOSA. 2, C. DEFLEXA. 3, C. TERRESTRIS. 4, C. MARGINATA. 5, C. SEPULTA.



Callitriche. 6, C. Nuttallii. 7, C. peploides. 8, C. occidentalis. 9, C. antarctica.

pedicels was mentioned as the typical form. Three years later this concept was reaffirmed; the plant with stalked fruits was treated as α *Brauniana*, with *C. deflexa* A. Br. as a synonym, and the sessile-fruited plants of both continents separated as β *Austini*. For *Austini* three cotypes[1] were listed, from Missouri, New Jersey and Pennsylvania, so if the sessile-fruited plants of the United States are separated from those of Central and South America, the name *Austini* belongs with the former.

C. deflexa var. **deflexa.** *C. deflexa* α *Brauniana* Hegelm. Verhandl. Bot. Ver. Brandenburg 9: 15. 1867; Hegelm. in Martius, Fl. Bras. 13, pt. 2: col. 13. 1882. *C. deflexa* β *Glaziovii* Hegelm. in Martius, l. c.—Fruit (0.5–) 0.7–0.9 mm. wide, (0.3–) 0.5–0.7 mm. high, on stalks 0.5–4 mm. long.—East coast of South America from Rio de Janeiro to Buenos Aires. **Brazil:** Rio de Janeiro, 1859–60, *Dr. Rudio* (ex herb. A. Braun, and probably ISOTYPES, MO, CM, GH); Curityba, Paraná, 2. 10. 1914, *P. Dusén* (*G. Jönsson* written on some labels) *1044a* (MO, GH, CM, US, NY); Rio Grande do Sul, São Leopoldo, August, 1941, *Leite 2796* (GH) & *613* (NY); Santo Amaro, Cap., S. Paulo, Sept. 14, 1944, *Roth 939* (SP). **Uruguay:** Montevideo, Nov., 1936, *Herter 696a* (CM, MO). **Argentina:** LaPlata, Provincia de Buenos Aires, Oct. 19, 1943, *Cabrera 9805* (LP—mixed with var. *subsessilis*).

While the fruits are consistently larger than those of the next variety, an occasional individual has some of the fruits, ap-

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PLATE 1170

(Numbers same as in keys and descriptions)

1. *C. turfosa.* 1a. Node, leaves and fruit, × 30. Argentina, *Eyerdam & Beetle 22385* (GH). 1b. Cross-section of fruit, × 30. Same collection. 1c. Portion of wing and face of fruit, × 187.5. Chile, *Johnston 5187* (GH).
2. *C. deflexa* var. *subsessilis.* 2a. Node, leaves, stamens and young fruit, × 30. Colombia, *Fassett 25071* (WIS). 2b. Face of fruit, × 30. Same collection. 2c. Cross-section of fruit, × 30. Same collection. 2d. Portion of wing and face of fruit, × 187.5. Same collection.
3. *C. terrestris.* 3a. Node, leaves and stamen, × 30. Illinois, *Chase 3903* (GH). 3b. Face of fruit, × 30. Same collection. 3c. Cross-section of fruit, × 30. Same collection. 3d. Portion of wing and face of fruit, × 187.5. Same collection.
4. *C. marginata.* 4a. Node, leaf, young root, and pedicelled fruit, × 30. California, *Tracy 1870* (UC). 4b. Face of fruit, × 30. California, *Tracy 1876* (UC). 4c. Cross-section of fruit, × 30. California, *Johnston 1948* (UC). 4d. Portion of wing and face of fruit, × 187.5. California, *Tracy 3137* (UC).
5. *C. sepulta.* 5a. Node, leaf, young fruits, and young root, × 30. Oregon, *Hall 459* (GH). 5b. Face of fruit, × 30. Same collection. 5c. Cross-section of fruit, × 30. Same collection.

PLATE 1171

(Numbers same as in keys and descriptions)

6. *C. Nuttallii.* 6a. Portion of stem, leaves, root, and pedicelled fruits, × 30. Alabama, *Mohr* on March 18, 1892 (NY). 6b. Cross-section of fruit, × 30. Same collection.
7. *C. peploides.* 7a. Node, leaves and fruits of var. *peploides*, × 30. Louisiana, *Langlois* in 1891 (NY). 7b. Face of fruit of var. *semialata*, × 30. Honduras, *Standley 56535* (CM). 7c. Face view of fruit of var. *media*, × 30. Guatemala, *Standley 83331* (CM). 7d. Top view of fruit, × 30. Same collection.
8. *C. occidentalis.* Portion of stem, leaves, root, fruits, × 30. Cuba, *Britton & Wilson 4515* (NY).
9. *C. antarctica.* 9a. Portion of stem, leaves, axillary buds, and stamen, × 30. Kerguelen's Land, *Kidder* in 1874 (US). 9b. Face of fruit, × 30. Same collection.

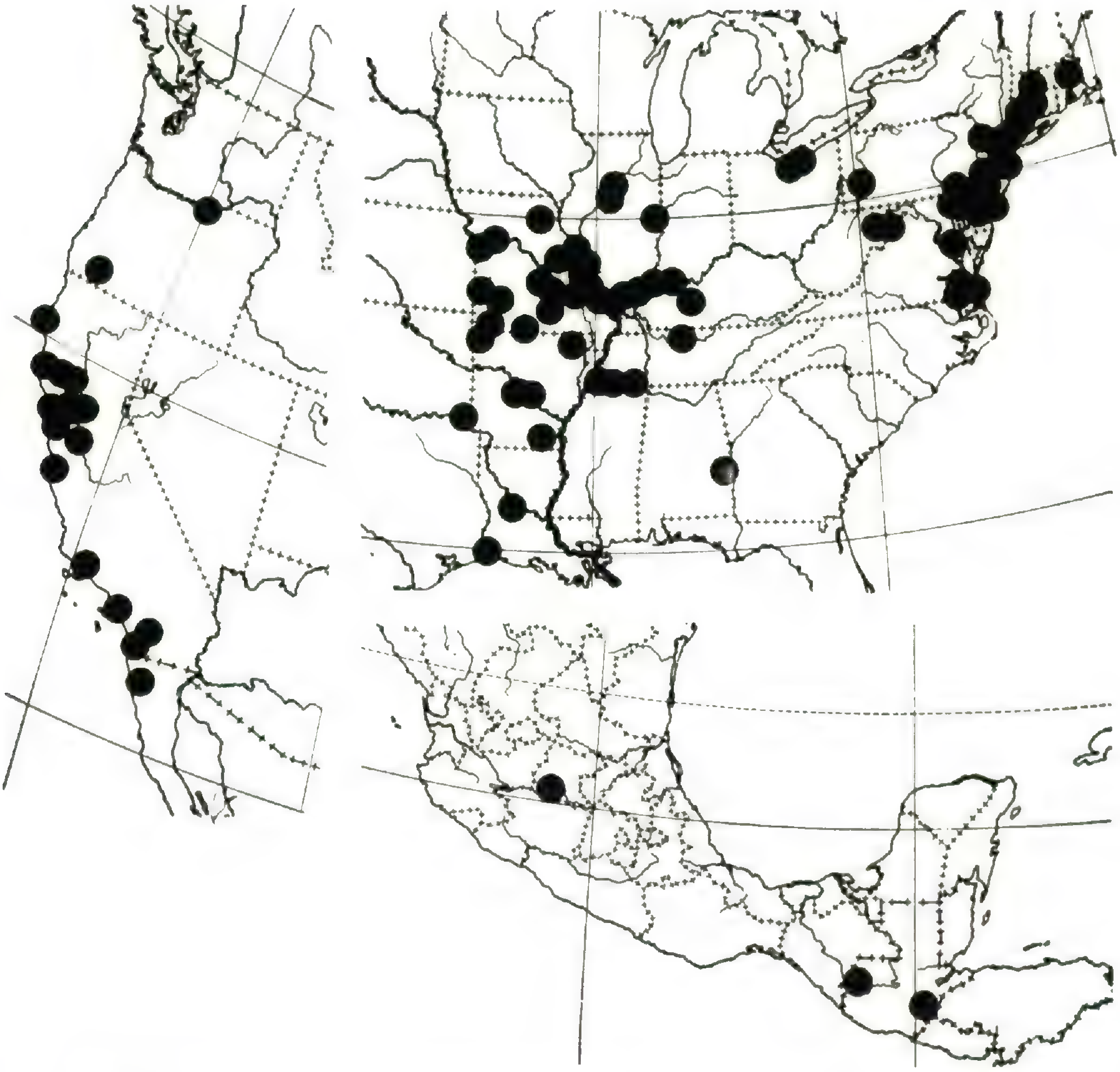
[1] Cf. Blake, Rhodora 45: 481–485. 1943.

parently mature, only about 0.5 mm. wide and 0.3 mm. high. Other parts of the same plant may bear fruits of normal size. *C. deflexa* var. *Glaziovii* was probably based on material with such small fruits; the collections cited by Hegelmaier have not been seen.

C. deflexa var. **subsessilis** n. var., fructibus 0.5–0.7 (–0.8) mm. latis, 0.3–0.5 (–0.6) mm. altis, cum alis 0.03–0.05 mm. latis; pedicillis 0.1–0.3 mm. longis. Fruits 0.5–0.7 (–0.8) mm. wide, 0.3–0.5 (–0.6) mm. high, with wings 0.03–0.05 mm. wide, and on pedicels 0.1–0.3 mm. long. *C. deflexa β Austini* Hegelm. Verhandl. Bot. Ver. Brandenburg 9: 15. 1867, and in Martius, Fl. Bras. 13, pt. 2: col. 13. 1882, as to South American plants but excluding the North American cotypes.—From Central Mexico southward to Argentina. **Mexico:** Nanchititla, Temascaltepec, 10–11–33, *Hinton 4988* (GH). **Guatemala:** Volcán Jumay, Jalapa, alt. 1300–2200 m., Dec. 1, 1939, *Steyermark 32440* (CM, NY); Guatemala, alt. 1500 m., Jan. 20, 1939, *Steyermaek 63106* (CM); Tajumulco, Dept. San Marcos, alt. 2300–2500 m., *Steyermark 36581* (CM). **Honduras:** Dept. Morazán, Río Yeguare, near El Zamorano, about 800 m., Feb. 27, 1947, *Standley & Molina 4671* (CM). **Colombia:** east of Bata, valley of Rio Chitagá, southwest of Pamplona, Dept. Norte de Santander, alt. 6500 ft., Oct. 13, 1944, *Fassett 25932* (TYPE in MO; CM, GH, US, NY, WIS); Vélez, Dept. Santander, April 17, 1944, *Fassett 25071* (MO, GH, WIS); Tequendama, Dept. Cundinamarca, Oct. 28, 1917, *Pennell 2648* (NY). **Brazil:** Caldas, prov. Minas Geraës, Sept. 22, 1867, *Regnell 1578* (NY, US, CM); Bello Jardim, Serra do Genipapo, Pernambuco, Nov. 14–15, 1924, *Chase 7710* (US); Ouro Preto, *Gomes 1751* (CM); Itatiba, S. Paulo, Nov. 26, 1930, *Leme 26697* (SP); Moóca, Cap., S. Paulo, Nov., 1912, *Brade 5778* (SP); Bahia, *Salzman* (MO). **Bolivia:** Región de Mapiri, San Carlos, Nov. 26, 1926, *Buchtien 1830* (NY). **Paraguay:** without locality, *Jörgensen 4509* (MO); Sud-Paraguay, *Kuntze* (NY). **Argentina:** Formosa, Aug., 1919, *Gonzalec 3240* (US, GH); Prov. Tucumán, Dept. Capital, 450 m., Aug. 1923, *Venturi 2052* (GH, US); Sierra de San Javier 14 kms. al oeste de Tucumán, July 14, 1949, *O'Donnell, Araque & Barkley 19Ar000* (US); Chaco, July, 1941, *Schulz 2996* (LP); Ribera de Rio de La Plata, Isla Santiago, Oct. 12, 1931, *Cabrera 1781* (LP); La Plata, Provincia de Buenos Aires, Oct. 19, 1943, *Cabrera 9805* (LP—mixed with var. *deflexa*).

3. **C. terrestris** Raf. emend. Torr. *C. terrestris* Raf. in Med. Repos. N. Y. 5: 358. 1808, *nomen ambiguum;* Torr. Comp. Fl. N. & Middle States 14. 1826; DC. Prod. 3: 71. 1828; House, N. Y. State Mus. Bull. no. 254: 473. 1924. *C. deflexa* A. Br. in Hegelm. Monogr. Callit. 58. 1864, as to some North American plants, not as to South American type. *C. deflexa β Austini* Hegelm. Verhandl. Bot. Ver. Brandenburg 9: 15. 1867, as to cotypes from Missouri and New Jersey, excluding cotype from Pennsylvania (*Moser*, 1832) and references to plants from South America; Morong, Bull. Torrey Club 18: 234. 1891; Robinson & Fernald in Gray's Manual, ed. 7: 550. 1908; Fassett, Man. Aquat. Pl. 241. 1940; Fernald in Gray's Manual, ed. 8: 973. 1950. *C. Austini* Engelm. apud Gray, Man. ed. 5: 428. 1867; Chapman, Fl. S. U. S., ed. 3: 420. 1897; Britton & Brown, Ill. Fl. North. States & Canada, vol. 2: 382. 1897; Small, Fl. Southeastern U. S. 723. 1903.—Fruit 0.6–0.9 mm. wide, 0.4–0.7 mm. high, on pedicels mostly 0.2 mm. long, rarely reaching 0.6 mm. long; mericarps usually equally rounded at each end (Fig. 3b) but rarely more broadly rounded above so that the fruit becomes slightly heart-shaped; faces of mericarps flat

(Fig. 3c); outer edges of mericarps appearing scarcely winged but under high magnification showing a very narrow wing with radii, but little anastomosing of radii (Fig. 3d); stigmas 0.2–0.4 mm. long, usually persistent and deflexed (Fig. 3b); anthers 0.1–0.2 mm. wide, on filaments 0.1–0.2 mm. long; leaves rather uniform, obovate-oblanceolate to spatulate, 2–3.5 mm. long, 0.6–1 mm. wide, very obscurely 3-nerved (Fig. 3a).—On damp soil, moist pathways, etc.; western Massachusetts and Connecticut to southeastern Virginia, westward in the mountains of Virginia, western Pennsylvania, northern Ohio, and in the Mississippi Valley from southern Indiana, northern Illinois and northern Missouri to Louisiana; apparently isolated in western Alabama. About half the collections examined are listed below. **Massachusetts:** Sunderland, Franklin Co., July 10, 1929, *Seymour 3385* (GH); Longfellow Park, Cambridge, July 1, 1945, *Hartman* (NEBC). **Connecticut:** Fairfield, July 22, 1898, *Eames 36* (US, GH); Southington, June 23, 1901, *Bissell* (GH); Southport, alt. 2–6 ft., July 17, 1891, *Eames 35* (GH). **New York:** Staten Island, May 26, 1889, *Britton* (NY). **New Jersey:** top of hills, Staten Island, N. Y., & Weehauken, N. J., June, 1842, *Austin* (NY, obviously two collections but no indication as to which is which); Paliasdes, Oct. 1864, *Austin* (MO—probably cotype *C. deflexa* var. *Austini*); Bergan Co., June 17, 1865, *Parker* (CM); Milltown, Middlesex Co., May 17, 1908, *Mackenzie 3059* (US). **Pennsylvania:** York Co., July 2–6, 1904, *Britton* (NY); Sellersville, 1883, *Fretz* (MO); Pittsburg, June 28, 1905, *Jennings & Kinzer 132* (MO). **Delaware:** Wilmington, June 15, 1881, *Commons* (GH, MO, US, NY); Townsend, *Canby* (CM); Leipsig, June 13, 1937, *Tatnall 3409* (GH). **Maryland:** Clinton, May 19, 1920, *Holm* (GH); Cecil Co., June 13, 1876, *Commons* (CM). **District of Columbia:** Brookland, May 10, 1896, *Holm* (US); Corcorans Woods, June 25, 1882, *Ward* (US). **Virginia:** Skipper's, Greenesville Co., May 21, 1939, *Fernald & Long 9968* (MO, GH, US, NY); Mt. Vernon, July 4, 1889, *Coville* (US); Stony Creek, Sussex Co., May 11, 1940, *Fernald & Long 11869* (GH); North Landing, Norfolk Co., May 6, 1935, *Fernald & Griscom 4447* (GH); Long Mt., Frederick Co., July 1, 1933, *Griscom & Hunnewell 18805* (GH). **Ohio:** Oberlin, Lorain Co., June 23, 1947, *Fassett 27645* (WIS). **West Virginia:** Petersburg, Grant Co., July 10, 1940, *Sharp & Fox* (WVA). **Kentucky:** Mammoth Cave, May 30, 1897, *Barnhart 2292* (NY); Hawesville, May 15, 1937, *Wadmond, Fassett, Curtis & Dunlop 21470* (WIS); Paducah, May 30–June 20, 1909, *Eggleston 4465* (NY). **Tennessee:** Nashville, May, *Gattinger 2463* (CM, MO, US, GH, NY); Chester Co., June, 1892, *Bain* (US); Memphis, May 20, 1851, *Fendler* (MO). **Alabama:** Auburn, Lee Co., April 16, 1898, *Earle & Baker* (MO, mixed with *C. Nuttallii*). **Indiana:** Henryville, Clark Co., June 18, 1935, *Hermann 6754* (GH); Leavenworth, Crawford Co., June 16, 1935, *Hermann 6685* (NY); Princeton, June 14, 1935, *Hermann 6607* (US). **Illinois:** Peoria, May 28, 1922, *Chase 3903* (GH); Menard Co., June 1878, *Hall* (CM); Mt. Carmel, May 9, 1888, *W. T.* [*release*] (MO); Richland Co., April 23, 1926, *Ridgeway 2482* (MO); Giant City State Park, Jackson Co., May 14, 1937, *Fassett 21471* (WIS); Cobden, Union Co., May 23, 1902, *Earle 699* (NY). **Missouri:** banks of the Mississippi south of the Meramec, May 28, 1864, [*Engelmann*] (MO, US, CM—probably COTYPE of *C. deflexa* var. *Austini*); Molino, Audrain Co., May 14, 1939, *Steyermark 22468* (CM); Eagle Rock, Barry Co., June 12, 1897, *Bush 64* (MO, US); Coloma, Carroll Co., June 25, 1938, *Steyermark 6195* (CM); Dunklin Co., May 17, 1892, *Bush* (MO); Gray Summit, Franklin Co., June 20, 1928, *Kellogg 1835* (MO); Grain Valley, June 19, 1898, *Bush 90* (MO, NY); Sarcoxie, Jasper Co., May 19, 1912, *Palmer 3681* (MO); Jasper, Jasper Co., July 17, 1910, *Palmer 3015* (MO); Foley,



2a (lower right). *C. deflexa* var. *subsessilis* in Mexico and Central America. 3 (upper right). *C. terrestris*. 4 (left). *C. marginata*.

Lincoln Co., May 25, 1933, *Steyermark 8132* (MO); Victor, Monroe Co., May 31, 1936, *Steyermark 10933* (MO); Starland, Perry Co., April 21, 1938, *Steyermark 4946* (MO, CM); Jerome, Phelps Co., May 13, 1914, *Kellogg 415* (MO, NY); Jonca Creek, Ste. Genevieve Co., May 30, 1933, *Steyermark 8802* (MO); Tyrone, Texas Co., June 1, 1935, *Steyermark 19184* (MO). **Arkansas:** Fayetteville, June, 1835, *Engelmann* (MO, GH); Little Rock, April, 1886 (NY); Monticello, Drew Co., May 14, 1939, *Demaree 19120* (MO); Imboden, May 14, 1924, *Wheeler 53* (CM); Pinacle, June 1, 1923, *Wheeler 82* (CM). **Louisiana:** Lake Charles, April 25, 1884, *Langlois* (NY); Calcasien, April, 1884, *Langlois* (MO). **Oklahoma:** McCurtain Co., June 16, 1930, *Little & Olmsted 662* (US).

Rafinesque's original description of *C. terrestris* did not mention fruit and was obscure: "stem procumbent spreading, leaves entire, thick, petioled, oblong, obtuse flowers monoiceous, it is

found in some moist grounds in New-Jersey and Pennsylvania." This might be considered to be either the plant described nearly 60 years later as *C. Austini* or else a terrestrial form of *C. heterophylla.* The latter, however, has the *thin* and *veiny* leaves petioled and rotund, or else sessile and linear. It seems probable, then, that *C. terrestris* was not *C. heterophylla,* in which case it could be only the plant later known as *C. Austini.*

Happily, before any other names appeared on the scene, *C. terrestris* was unquestionably applied in the present sense, by Torrey in 1826 and by DeCandolle in 1828.

Torrey described 3 species: (1) *C. verna β intermedia* with margin of the capsule obtuse and upper leaves spatulate-obovate, i. e., *C. heterophylla* of present treatments; (2) *C. autumnalis* with "leaves all linear, 1-nerved, . . . capsule with an acute margin . . . superior leaves a little broader and 3-nerved"—probably a mixture of *C. verna* and *C. hermaphroditica;* and (3) *C. terrestris,* "procumbent, diffuse; leaves oblong, uniform, rather obtuse; capsule grooved on the margin . . . capsule very short, and broad," i. e., the plant later described as *C. Austini.* The clear description by Torrey can, then, be taken as fixing the application of the name *C. terrestris* Raf.

The application of *C. terrestris* as fixed by Torrey was followed two years later by DeCandolle. He had four species: (1) *C. verna,* with "carpellorum dorso obtusiusculo," from both Europe and North America, probably including both *C. verna* and *C. heterophylla* as understood today; (2) *C. pedunculata* of Europe; (3) *C. autumnalis,* the *C. hermaphroditica* of the present treatment; and (4) *C. terrestris,* with "fructibus sessilibus latis brevibus emarginatis," which could be, again, only the *C. Austini* of later treatments.

In Rhodora 43: 589. 1941, Fernald warned against use of the name *C. terrestris* for the "barely separable variety of the South American *Callitriche deflexa,*" on the basis of certain statements by Hegelmaier in 1867. He quotes Hegelmaier that "Was in den Herbarien unter dem Namen *C. terrestris* Raf. liegt, sind Landformen verschiedener Species, namentlich auch von *C. verna* und *heterophylla.*" But if the presence of misidentified specimens in many herbaria were to be considered as fixing the application of names, the nomenclature of *Callitriche* would be even

more complex than it is now. Hegelmaier, indeed, did not advance this as a reason for ruling *C. terrestris* from consideration. Perhaps Rafinesque had mixed material, he says, but certainly the *C. terrestris* of DeCandolle was this species—"Es ist nicht unwahrscheinlich, dass, wo nicht Rafinesque, so doch Decandolle im Prodromus die Form β unter seiner *C. terrestris* verstanden hat." If, continues Hegelmaier, one could demonstrate that DeCandolle had original material from Rafinesque, which one cannot do at present—"wenn sich wirklich nachweisen liesse, dass Decandolle hierbei originalien von Rafinesque vorgelegen haben, was ich zo thun jetzt nich im Stande bin," then *C. terrestris* Raf. should be taken up as having priority over *C. deflexa* and β *Austini*.

Whether or not DeCandolle's use of the name *C. terrestris* was guided by posession of Rafinesque's material is academic: we can take the use of the name by Torrey and by DeCandolle as fixing its use, long before the publication of *C. deflexa* and *C. Austini*.

C. deflexa β *Austini*, as described by Hegelmaier, was constituted of several elements. It embraced two distinct entities, i. e., *C. terrestris* (plants from Missouri, New Jersey, Arkansas, and perhaps New York and Texas) and *C. deflexa* var. *subsessilis* (Mexico, Brazil). Of the four collections cited (cotypes), one, *C. J. Moser* from Philadelphia, is *C. heterophylla*.

4. **C. marginata** Torr. U. S. Rept. Expl. Miss. Pacific 4: 135. 1857; Hegelm. Verhandl. Bot. Ver. Brandenburg 9: 12. 1867; Wats. Bot. Calif. 2: 76. 1880; Morong, Bull. Torrey Club 18: 235. 1891; Jepson, Fl. Calif. 2, pt. 7: 433. 1936; Peck, Man. Higher Pl. Ore. 466. 1941. *C. marginata* α *Torreyana* Hegelm. l. c. *C. Nuttallii* Jepson l. c., 434, not Torr.—Fruits on somewhat inflated pedicels of varying lengths, often buried in the mud at maturity, 0.8–1.2 mm. wide and not quite so high (Fig. 4a); wing 0.1–0.2 mm. wide, sometimes very sharply differentiated from the surface of the mericarps (Fig. 4b); stigmas 1 mm. or less long, sharply deflexed, persistent (Fig. 4a) or caducous (Fig. 4b); leaves nearly uniform, spatulate, the largest 3.5–8 mm. long and 0.8–2 mm. wide, 1–3-nerved (Fig. 4a).—Usually on the mud at the edge of pools, less commonly in the water; northern Oregon to northern Lower California. **Oregon**: The Dalles, 1884, *Howell* (GH); Grant's Pass, *Howell* (GH). **California**: Valley Springs, Calaveras Co., April, 1930, *Mason 5544* (UC); Princeton, Colusa Co., May 2, 1902, *Heller & Brown 5440*, distributed as *Elatine brachysperma* (US, GH, NY, CM); Walnut Creek, Contra Costa Co., March 16, 1932, *Mason 6810* (UC, GH); Deer Valley, Briones Road, Contra Costa Co., March 20, 1932, *Mason 6852*, mixed with *C. longipedunculata* (UC, GH); "Connick claim," 4 miles S. E. of Eureka, alt. 0–500 ft., May 23, 1909, *Tracy 2975*, mixed with *C. heterophylla* var. *Bolanderi* (UC); Miranda, Humboldt Co., alt. 400 ft.,

March 29, 1925, *Tracy 6948* (UC); Salmon Creek Valley, around Humboldt Bay, alt. 100 ft., June 17, 1917, *Tracy 4823* (UC); Santa Monica, *Hasse 4795* (NY); Olema to Bolinas Road, Marin Co., March 1, 1932, *Mason 6805* (UC); Ignacio, Marin Co., alt. ca. 20 ft., April 18, 1946, *Rose 46039* (MO); Ukiah, Mendocino Co., 1866, *Bolander 4658* (UC—mixed with another sterile species, MO); Fort Bragg, Mendocino Co., June, 1930, *Mason 5641* (UC); Merced to Snelling, Merced Co., March 16, 1932, *Normay 706b* (UC); Calistoga, Napa Co., May 15–18, 1903, *Tracy 1870* (UC, US); Pacific Grove, Monterey Co., May 1, 1907, *Heller 8500*, distributed as *Elatine brachysperma* (US, GH, NY, CM); Sacramento, April 3, 1934, *Copeland* (UC); Elsinore Mts., Riverside Co., May 18, 1941, *Munz 16658* (MO); Red Hill near Upland, San Bernardino Co., May 4, 1917, *Parish 11153* (UC, GH); Red Hill, April 28, 1917, *Johnston 1756* (UC, GH); Mt. Soledad, La Jolla, San Diego Co., March 2, 1922, *Wiegand & Upton 3768* (CM); Mesas, San Diego Co., April 25, 1884, *Orcutt*, TYPE of *C. longipedunculata*, but mixed with *C. marginata* (GH) or consisting entirely of *C. marginata* (US); Waverly, San Joaquin Co., 1890–91, *Sanford 360* (UC); Searsville, 1866, *Bolander 78*, mixed with *C. heterophylla* (GH); French Camp, San Joaquin Co., 1890–91, *Sanford 91* (MO); Bloomquist's Mill, San Mateo Co., April 23, 1927, *Mason 3697* (UC); Pacheco Pass, Santa Clara Co., April 17, 1932, *Mason 6961* (UC); Mark West's Creek, Sonoma Co., April 30, 1854, *Bigelow* (COTYPE in GH, MO, US, NY); Puerta Cañon, Stanislaus Co., June 11, 1862, *Brewer 1256* (MO, UC, US); Modesto, Stanislaus Co., March 15, 1935, *Hoover 323* (UC); without locality, *Rev. A. Fitch* (COTYPE in US, MO, NY). **Baja California:** Guadaloupe ranch, northern Lower California, April 6, 1886, *Orcutt* (MO).

The habitat, to judge from the well-annotated material in the Herbarium of the University of California, is mainly on the drying mud of vernal pools. This species has been much confused with *C. longipedunculata,* which also grows in vernal pools but is more often in permanent standing water. *C. longipedunculata* may apparently be found in the water of a pool while *C. marginata* prefers the muddy shore; fluctuations in water level undoubtedly bring about a mixing of the two. Several collections, including the type of *C. longipedunculata*, are mixed; it is not possible to determine whether they actually grew with their stems intertwined or if the collector took a handful from the shore and another from the water.

(To be continued)

PLANTS FROM THE VICINITY OF FAIRBANKS, ALASKA

(Contributions to the Flora of Alaska, No. 1)[1]

LOUIS H. JORDAL[2]

DURING the month of July, 1950 the author was delayed a few days while awaiting transportation into the Brooks Range region from Ladd Air Force Base, Fairbanks. These were spent mostly in preparing supplies and equipment for the botanical enterprises in the Brooks Range on which I have been engaged for two years under the auspices of the Botanical Gardens, University of Michigan.[3]

On a few occasions during this period, with my brother, Mr. Odd Jordal, I had an opportunity to collect a few numbers in the immediate vicinity of Fairbanks. The present account lists about 50 different species, some of which have not been reported from Alaska previously. This list does not fit well into a report on the vegetation of the Brooks Range which is now under preparation, and for that reason it is published separately.

LIST OF THE PLANTS

TYPHA LATIFOLIA L. Dense stands in shallow water along margins of bog-lake near Chena Slough, July 12, 1950, no. *3537*.

Strangely enough this species is not included in Hulten's Flora of Alaska in spite of the fact that it is rather common in paludose situations in the vicinity of Fairbanks which perhaps is its northernmost station in America.

SPARGANIUM MINIMUM (Hartm.) Fr. In dried-up bed of bog-pond, no. *3528*.

POTAMOGETON FILIFORMIS Pers. var. BOREALIS (Raf.) St. John. Submersed in swift water, Chena Slough, no. *3542*.

TRIGLOCHIN PALUSTRE L. Scattered on wet, mossy banks of Chena Slough, no. *3547*.

GLYCERIA MAXIMA (Hartm.) Holmb. Scattered on bare, silty ground, no. *3539*.

[1] Paper No. 937 from the Department of Botany, University of Michigan.

[2] Research Assistant, Botanical Gardens, University of Michigan.

[3] The author is indebted to the Arctic Institute of North America for the grant-in-aid which made the botanical activities of 1950 possible and to the Director of the Botanical Gardens, University of Michigan, for continouus aid and support in exploring the flora of Alaska.

Lemmas 2.5–3 mm. long; stamens 1–1.3 mm. long. Hulten (Fl. Al. pt. II: 229) would relegate *G. grandis* Wats. to subspecific status under *G. maxima*. Recently Church (Am. Jour. Bot. 36: 155–165, 1949) has reviewed the genus for North America and reports that *G. maxima* is a hexaploid while *G. grandis* is a diploid. The quantitative features enumerated by that author as differentiating the two clearly set them apart and is it therefore better to regard them as two separate species.

Eriophorum Scheuschzeri Hoppe. Open stands along silty banks of Chena Slough, no. *3534*.

Scirpus microcarpus Presl. Scattered on bare, silty ground, no. *3538*.

In the National Herbarium, Wash. D. C. there is a specimen of this species from Fairbanks (*Scamman* no. *1644*). My record seems to be the second one of this otherwise coastbound species from interior Alaska.

Eleocharis palustris (L.) R. and S. Dense tufts in bed of overflow channel, no. *3533*.

Carex athrostachya Olney. Small tufts in bed of overflow channel, no. *3525*.

This appears to be the first record of this species from interior Alaska.

Carex canescens L. Dense tufts on wet, low banks of Chena Slough, no. *3532*.

Carex diandra Schrank. Dense rufts along low, wet banks, no. *3560*.

Carex media R. Br. Large, dense tufts in moist alder and willow thickets along road, no. *3531*.

Juncus filiformis L. Dense, small tufts in dry, open situations, no. *3526*.

Platanthera hyperborea (L.) Lindl. Scattered on high, dry banks of Chena Slough, no. *3545*.

Salix myrtillifolia Anders. Low ascending shrub along dry roadsides, no. *3552*.

Polygonum Convolvulus L. Prostrate on bare, moist and silty ground near Chena Slough, no. *3530*.

Chenopodium capitatum (L.) Aschers. Along roadsides, no. *3540*.

Moehringia lateriflora (L.) Fenzl. Dense tufts on bare soil in dry, open situations, no. *3544*.

Spergula arvensis L. Scattered in dry, open field on slopes above Chena Slough, no. *3520*.

Silene Williamsii Britton. Low, dense tufts on dry gravelly slope, no. *3510*.

Nymphaea tetragona Georg. ssp. Leibergii (Morong) Pors.

In the private collection of an enthusiastic amateur botanist, Mrs. Jack Bollerud at Ladd Air Force Base, I discovered a

specimen of the above species said to have been collected near Fairbanks. This species is not reported in Hulten's Flora.

Caltha natans Pallas. Prostrate in dried-up bed of bog-pond, no. *3529*.

Delphinium glaucum Wats. Scattered on slope within open stand of mixed-forest, no. *3561*. Follicles strongly villous on the sutures, sparsely long pilose throughout.

Ranunculus hyperboreus Rottb. Prostrate in wet, lowland depressions, no *3516*.

Ranunculus sceleratus L. var. multifidus Nutt. Scattered on bare, moist silt along banks of Chena Slough, no. *3517*.

Ranunculus pensylvanicus L. f. Scattered in bed of overflow channel, no. *3523*.

Corydalis aurea Willd. On dry, gravelly slopes above Chena Slough, no. *3511*.

Arabis hirsuta (L.) Scop. var. pycnocarpa (Hopkins) Rollins. Along dry roadside, no. *3556*.

Erysimum cheiranthoides L. Along dry roadside, no. *3555*.

Torularia humilis (Mey.) Schulz. Dense tufts on bare soil along dry roadside, no. *3553*.

Amelanchier alnifolia (Nutt.) Nutt. Low shrub along dry roadside, no. *3507*.

Astragalus alpinus L. var. alaskanus Hult. Dense decumbent tufts along dry roadside, no. *3515*.

Oxytropis varians (Rydb.) Hult. In dry, open field along banks of Chena Slough, no. *3551*. This plant was kindly identified by Mr. A. E. Porsild.

Epilobium adenocaulon Hausskn. Scattered, in moist roadside situation, no. *3536*.

Epilobium palustre L. Scattered, in moist roadside situation, no. *3535*; on wet banks of Chena Slough, no. *3546*.

Circaea alpina L. Dense stand in moist, lowland willow thicket, no. *3518*.

Androsace septentrionalis L. Diffuse tufts on dry, gravelly slope, no. *3514*.

Apocynum androsaemifolium L. In dry field above Chena Slough, no. 3513.

Collomia linearis Nutt. On bare soil along dry roadside, no. *3548*.

Dracocephalum parviflorum Nutt. Dense tufts on dry, gravelly slope, no. *3509*.

Scutellaria galericulata L. var. **epilobiifolia** (Hamilt.) Jordal comb. nov. Basinym *S. epilobiifolia* Hamilt. In overflow channel with rank berbs, no. *3522*.

It is clear from Epling's discussion in Am. Jour. Bot. **26:** 17, (1939) that this species exhibits a different mode of variation in America than it does in Eurasia although one must agree that the differences exhibited by the American populations are not as specific as Fernald in Rhodora **23**: 85 (1921) makes them. Nevertheless, it is this writer's opinion, based on field experiences both in North America and Scandinavia that the high grown,

thin-leaved type which is so frequently found in the Western Hemisphere is sufficiently distinct from the average European material to warrant status as a geographical race, i. e. as variety. The American material differs "consistently from the Eurasian *S. galericulata* in the low pebbling of the nutlets," according to Fernald in Gray's Manual of Botany, 8th ed. p. 1221.

VERONICA SCUTELLATA L., f. VILLOSA (Schum.) Pennell. Scattered, in dry open fields above Chena Slough, no. *3543*.

This species is known from the Yukon but has not been reported from Alaska before. It appeared to be quite common in dry, open situations near Fairbanks.

CASTILLEJA PALLIDA (L.) Spreng. ssp. CAUDATA Pennell. On high, dry banks of Chena Slough, no. *3558*.

EUPHRASIA SUBARCTICA Raup. Scattered, along dry, open roadside, no. *3527*.

UTRICULARIA MACRORHIZA Le Conte. Immersed in lowland bog-pond, no. *3524*. Plants blooming profusely.

PLANTAGO MAJOR L. Common weed along dry roadsides, no. *3557*.

GALIUM TRIFIDUM L. With rank herbs in overflow channel, no. *3521*.

ANTENNARIA OXYPHYLLA Greene. Dense colonies on dry, sandy slopes above Chena Slough, no. *3508*. This plant was kindly identified by Mr. A. E. Porsild.

ARTEMISIA FRIGIDA Willd. Dense tufts on dry, gravelly slopes above Chena Slough, no. *3509*.

ARNICA ALPINA (L.) Olin, ssp. ATTENUATA (Greene) Maguire. On dry slopes in open mixed-forest on low hill, no. *3559*.

SENECIO PAUCIFLORUS Pursh. Along dry roadside, no. *3550*. Plants unusually tall and coarse.

SAUSSUREA ANGUSTIFOLIA DC., f. **ramosa** f. nov. A forma typica caulibus altis ramossisimis inflorescentiis longis ramosis, capitulus multis, differt.

Differs from the typical species in its tall, rank habit and in the long-branched, multi-headed inflorescence. Type in Herbarium, University of Michigan: along dry roadside near Fairbanks, July 13, 1950, *Jordal no. 3554*.

S. angustifolia is a very variable plant in Alaska. The form described above is an extreme one with the features enumerated.

CREPIS TECTORUM L. Weed along dry roadside, no. *3550*.

This appears to be the first record of this common weed from Alaska.

PREVIOUSLY UNREPORTED PLANTS FROM MINNESOTA.—Three species and two color forms are herewith placed on record from St. Louis County.

Rhynchospora fusca (L.) Ait. f., Lakela 11043, was discovered on Aug. 3, 1950, in a quaking sedge-mat along Highway 35 at

Wahlsten, south of Tower, while I was collecting *R. alba*. The latter, in full anthesis whitened the habitat, in contrast to its rare congener already in full fruit. The sedge-mat surrounding a vanishing lake in the center of the spruce-tamarack bog, supported a remarkable association of species, rare and local in the area, e. g. *Trigolochin palustris* L., *Carex limosa* L., *Eleocharis pauciflora* (Lightf.) Link., var. *Fernaldii* Svenson, and *Utricularia cornuta* Michx., encircling the open water in abundance, on each side of the highway, and filling the moss-pools with yellow blooms. In the interior of the continent, *R. fusca* is reported from Wisconsin, Michigan, and Ontario. Minnesota specimens are identical with those of Dr. N. C. Fassett, from Wisconsin.

Aster laevis L., f. *Beckwithiae* House, the white form, occurs with the typical form in the west central part of the county. Collection, Lakela 12070, was made in a mixed forest, terrace of Side Lake, of Sturgeon Lake, about 20 miles north of Hibbing. The flowers on drying turned pale lilac.

Cypripedium acaule Ait., f. *albiflorum* Rand & Redfield, a single plant with a wholly white flower, Lakela 10268, was discovered by Miss Mary I. Elwell among typical forms in lichen mats under pines on high granite ledges across the road from Kabetogama State Forestry Station, northwest part of the county, June 11, 1950. The flower on drying turned pinkish.

Penstemon pallidus Small, Lakela 10650, roadside vegetation on Highway 2, about 35 miles west of Duluth, July 1950, seems well established. The species has reached Minnesota from the southern states.

To the adventive flora is added *Potentilla intermedia* L., Lakela 11081, Aug. 2, 1950, growing in sand, on terrace of Armstrong Lake, south of Ely. It first came to attention on June 20, 1949, when the plants weie in flower, Lakela 8303. The colony is established on the main trail to the tourist cabins.—Olga Lakela, University of Minnesota, Duluth Branch.

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CALLITRICHE IN THE NEW WORLD

NORMAN C. FASSETT

(*continued from p. 155*)

5. **C. sepulta** Wats., Proc. Amer. Acad. 14: 298. 1879; Wats., Bot. Calif. 2: 77. 1880; Morong, Bull. Torrey Club 18: 235. 1891; Howell, Fl. N. W. Amer. 218. 1898.—**Oregon:** Salem, 1871, *Hall 459* (TYPE in GH, ISOTYPES in CM, MO, NY); Silverton, June 1871, *Hall* (MO).

This is very close to *C. marginata,* differing mainly in its thicker nearly linear one-nerved leaves (Fig. 5a). Morong and Howell obviously drew their descriptions from that of Watson. Watson wrote that *S. sepulta* resembles a terrestrial form of *C. marginata;* his description of the latter species, however, betrays the fact that his *C. marginata* was a mixture of the true *C. marginata* and the more aquatic *C. longipedunculata.*

6. **C. Nuttallii** Torr. U. S. Rept. Expl. Miss. Pacific 4: 135. 1857; Hegelm. Verhandl. Bot. Ver. Brandenburg 9: 16. 1867; Engelm. in Gray, Man. ed. 5: 428. 1867; Morong, Bull. Torrey Club 18: 235. 1891; Small, Fl. Southeastern U. S. 723. 1903; Fernald in Gray's Manual, ed. 8: 973. 1950. *C. pedunculosa* Nutt. Trans. Amer. Phil. Soc. N. S. 5: 140. 1835, not *C. pedunculata.*—Fruit on pedicels of various lengths, buried in the mud at maturity, 1 mm. wide, 0.6–0.8 mm. high, 0.3–0.5 mm. thick; mericarps with flat faces, the margins with a thin wing that is curled toward the face to give the appearance of thickened margins (Figs. 6a, 6b); stigmas about 0.8 mm. long, sometimes persistent and loosely ascending or somewhat reflexed; filaments 0.2–0.5 mm. long; anthers 0.2–0.3 mm. wide; leaves 3–4 mm. long, 0.5–1.5 mm. wide, oblanceolate-obovate, very obscurely 3-veined.—Gulf Coast, Alabama to eastern Texas, inland to central Alabama, Arkansas and the Coastal Plain of Texas.—**Alabama:** Richmond, Dallas Co., April 1, 1933, *Harper 3027* (US, GH); Citronelle, March 17, 1897, *Baker* (MO, NY); Auburn, Lee Co., April 16, 1898, *Earle & Baker*, mixed with *C. peploides* and *C. heterophylla* (NY); Mobile, March 18, 1892, *Mohr* (NY), March 10, 1892, *Mohr*, mixed with *C. peploides*

(NY), March 31, 1892, *Mohr*, mixed with *C. peploides* (US). **Mississippi:** Biloxi, March 15, 1898, *Tracy 5339* (NY, CM, US, MO). **Arkansas:** "from Arkansas to the Pottoe"—Nutt., Trans. Amer. Phil. Soc. N. S. 5: 140. 1837—this would be Fort Smith, COTYPE cited by Hegelmaier (MO). **Louisiana:** without locality, *Hale*, COTYPE cited by Hegelmaier (MO, GH mixed with *C. terrestris*); Chinchuba, April 21, 1891, *Langlois*, mixed with *C. peploides* (NY); Sidell Station, March 24, 1886, *Langlois* (NY); Alexandria, *Hale* (US); Monroe, April 13, 1901, *Trelease* (MO); Madisonville, May 4, 1888, *Joor* (MO). **Texas:** College Station, Brazos Co., March 1, 1938, *Cory 27926* (GH); Houston, April 17, 1900, *Bush 22*, mixed with *C. peploides* (MO); Bastrop Co., March 9, 1947, *Tharp 47034* (MO).

Notes on the structure and habit of this species, by Prof. Wm. M. Carpenter with a collection from Louisiana (NY), were quoted in part in the Torrey Bulletin 6: 173. 1877, and seem worth quoting again, in full: "Callitriche—resembles C. terrestris but differs from it in some respects. Bracts 2, opposite, calyx inconspicuous. Petals 0. Style o/o. Germ at first spherical, afterward reniform. Small, procumbent, diffuse. Lvs. uniform, oblong obovate, rounded at summit, at base tapering to a petiole, opposite, connate. The flower is axillary, the germ sessile at first, but afterward peduncled; the peduncles turning downward and the reniform fruit is buried beneath the surface in the same manner as in the Arachis hypogea. It grows in little patches as the C. terrestris, which it differs from in the circumstance of burying the fruit, and somewhat in the form of the fruit. It roots at the lower joints and being also attached to the ground by the elongated peduncles it is very hard to detach from the soil. Grows in old fields, damp soils. Flowers from Feb. to June."

7. **C. peploides** Nutt. Trans. Amer. Phil. Soc. N. S. 5: 141. 1835; Engelm. in Gray, Man. ed. 5: 428. 1867; Hegelm. Verhandl. Bot. Ver. Brandenburg 9: 17. 1867; Morong, Bull. Torrey Club 18: 238. 1891; Chapman, Fl. s. U. S. ed. 3: 420. 1897; Small, Fl. Southeastern U. S. 723. 1903. *C. Drummondi* Hegelm. Monogr. Gattung Callitriche 60. 1864.—Fruit black when ripe, 0.5–0.8, mm. usually 0.7 mm. wide, not quite so high; mericarps narrowed and elongated at base, pushing against each other so that each is bent at an angle with the face, and the fruit appears greatly thickened at base; stigmas about 0.2 mm. long, often persistent and loosely reflexed; filaments about 0.2 mm. long; anther about 0.1 mm. wide; stems rooting below, so presumably creeping, the erect branches 1–5 cm. high (Nuttall says "Stems perfectly erect"); leaves only slightly crowded at the tips of the branches, 2–5 mm. long, cuneate to spatulate-obovate, 1–3-nerved but often so faintly so as to appear nerveless.—Coastal South Carolina and Florida, through Alabama and rarely Tennessee to Louisiana and southeastern Arkansas, southeastern Texas and eastern Mexico to Costa Rica.

C. peploides var. **peploides.** Base of mericarps turned nearly or quite at right angles to the face of the fruit, so that the fruit is nearly as thick as wide (Fig. 7a); margin of carpels rounded or obtusely angled.—South Carolina, Tennessee and southern Arkansas, south to Cuba and northeastern Mexico.

South Carolina: St. Helena Island, May 5, 1899, *Cuthbert 336* (NY). **Georgia:** Tebeauville,[1] April, 1869, *Canby* (MO); Faceville, Decatur Co., March 31, 1847, *Thorne & Muenscher 2539* (Herb. Thorne). **Florida:** Hibernia, March, 1869, *Canby* (MO, UC, US, CM); So. Jacksonville, April 13, 1897, *Churchill* (MO, GH); Jacksonville, March, *Curtiss 2462a* (US, MO, NY, CM, GH); Ormond, March 15, 1904, *Fuller* (GH); Miami, May, 1877, *Garber* (GH); Jacksonville, June 1898, *Hitchcock* (CM); So. Jacksonville, April 13, 1897, *Lighthipe 727* (NY); Fort Meyers, Lee Co., March 19, 1916, *Standley 24* (US, MO, NY, CM, GH); Orange Co., Orlando, March 17, 1946, *Standley 92644* (CM). **Alabama:** Auburn, Lee Co., March 24, 1897, *Earle & Baker* (MO) and March 16 (NY—mixed with *C. Nuttallii & C. heterophylla*); Mobile, several dated in March, 1892, *Mohr*, sometimes mixed with *C. Nuttallii* (US, NY). **Tennessee:** Nashville, May, *Gattinger 2463*, mixed with *C. terrestris* (US). **Arkansas:** "banks of the Mississippi, and on the margins of ponds," *Nuttall*, mixed with *C. terrestris & C. Nuttallii* (ISOTYPE in NY). **Louisiana:** Covington, March 5, 1920, *Arsène 11931* (US); New Orleans, *Drummond*, probably ISOTYPE of *C. Drummondi* Hegelm. (NY, GH); Baton Rouge, Jan. 21, 1874, *Joor* (MO); Mandeville, April 21, 1891, *Langlois* (NY); Plaquemines Co., April 5, 1883, *Langlois 60* (NY); St. Martinsville, March 6, 1885, *Langlois* (NY); Sidell Station, March 24, 1886, *Langlois* (NY). **Texas:** Gonzales Co., March 28, 1927, *Bogusch 959* (US); Houston, April 17, 1900, *Bush 22*—mixed with *C. Nuttallii* (MO); Alligator Lake, Jackson Co., April 2, 1936, *Drushel 10014* (US); Houston, April 1, 1872, *Hall 544* (US, MO—mixed with *Elatine triandra* var. *obovata*, NY, CM); Houston, Nov. 27, 1877, *Joor* (MO); Harris Co., May 1877, *Joor* (US); Palmetto State Park, Gonzales, March 29, 1941, *Innes 660* (GH); Wilson Co., March 5, 1937, *Parks 21345* (GH); Hungerford, Wharton Co., March 9, 1914, *Palmer 4893* (MO, CM); House Mt., Llano Co., May, 1885, *Reverchon 1589* (US, MO, CM); Austin, May 19, 1922, *Tharp 1504* (US); San Jacinto Co., March 30, 1935, *Tharp 47003* (MO, UC); Palmetto State Park near Ottine, Gonzales Co., March 1, 1936, *Tharp 47004* (UC); Smith's Point, Chambers Co., Oct. 8, 1936, *Tharp 47006* (MO); Rockport Point, Aransas Co., April 2, 1932, *Tharp 47011* (UC); Austin, Travis Co., March 10, 1937, *Tharp 47013* (MO, UC); Galveston Island, May 1843, *Lindheimer* (MO). **Cuba:** in fl. St. John, Mantanzas, *Rugel 234bis*, mixed with *C. occidentalis* (NY); Chirreva, Feb. 28, 1860–64, *Wright 2547*, mixed with *C. occidentalis* (MO, GH). **Mexico:** San José, Tamaulipas, Feb. 17, 1939, *LeSueur 126* (GH); Huauchinango, Puebla, March 27, 1945, *Sharp 45374* (WVA).

C. peploides var. **semialata,** n. var.,[2] base of mericarps only slightly twisted so that the fruit is a little strumose at base (Fig. 7b); margins of carpels narrowly winged at summit (Fig. 7b).—**Mexico:** Tepic, Nayarit, Feb. 11, 1927, *Jones 22877*, ISOTYPE of *C. mexicana* Jones, *nomen nudum* (GH, UC); Morales, San Luis Potosi, 1876, *Schaffner 123a* in part (GH); Puebla, State of Puebla, Oct. 7, 1906, *Arsène 367* (US); Huauchinango, Puebla, March 24, 1945, *Sharp 43311* (WVA); Chinantla, Puebla, *Liebmann* (CM); Barranca of Texola, near Jalapa, April 30, 1899, *Pringle 7817* (US, GH); Jalapa, Nov. 28, 1905,

[1] A railroad station abandoned in 1870, according to Dr. Wilbur H. Duncan, *in litt.*
[2] **C. peploides** var. **semialata,** var. nov., fructibus ad basem substrumosis, ad apicem anguste alatis. Jalapa, Mexico, Nov. 28, 1905, *Trelease 20*, TYPE in Herb. Missouri Botanical Garden.

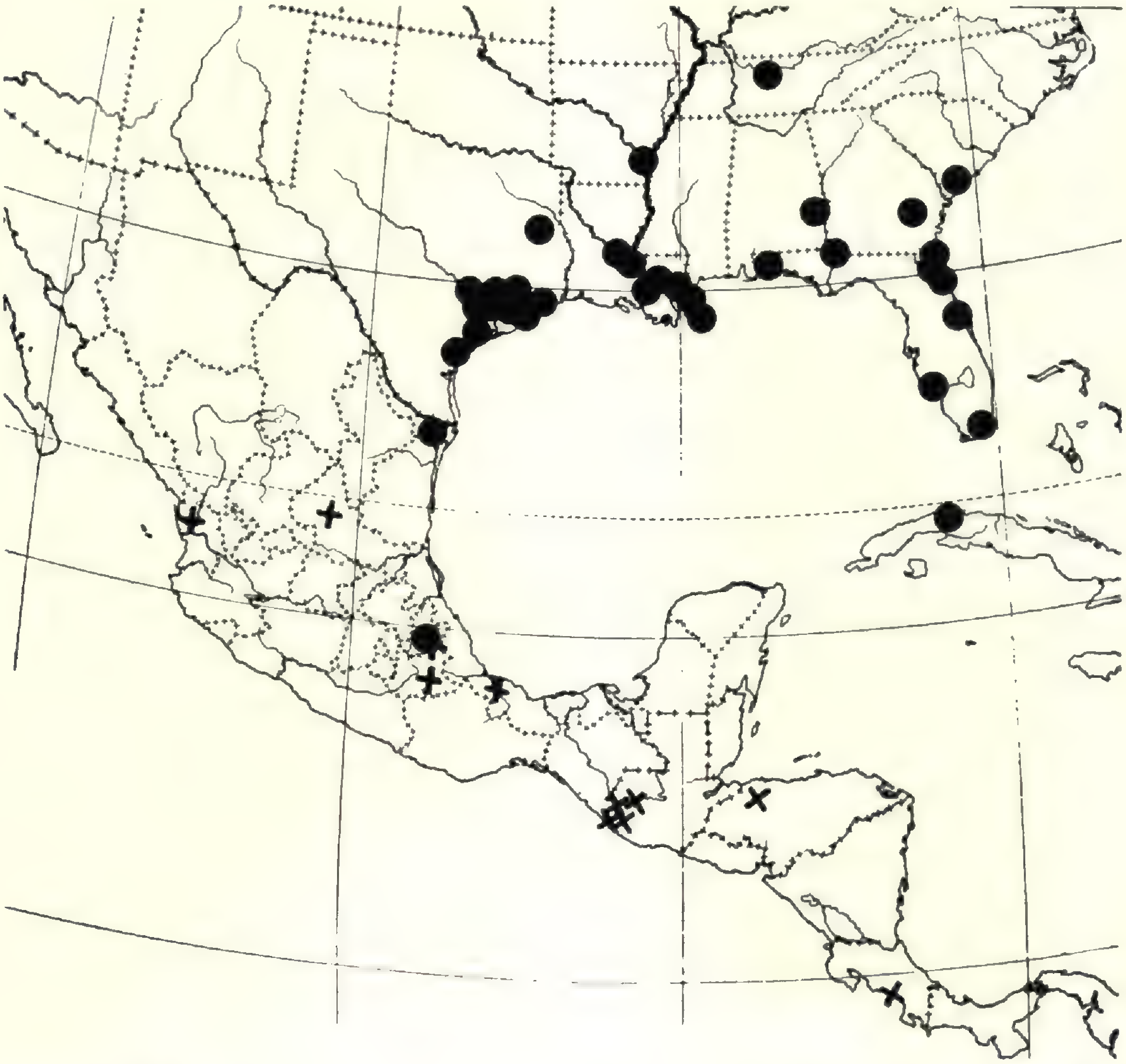
Trelease 20 (Type in mo); Colipa, Dept. Vera Cruz, March, 1841, *Liebmann 1086* (uc); Wartenberg, near Tantoyuca, Prov. Huasteca [Vera Cruz], 1856, *Ervendberg 143* (gh). **Honduras:** Siguatepeque, Dept. Comayagua, alt. 1080–1400 m., Feb. 14–27, 1928, *Standley 56535* (cm, us).

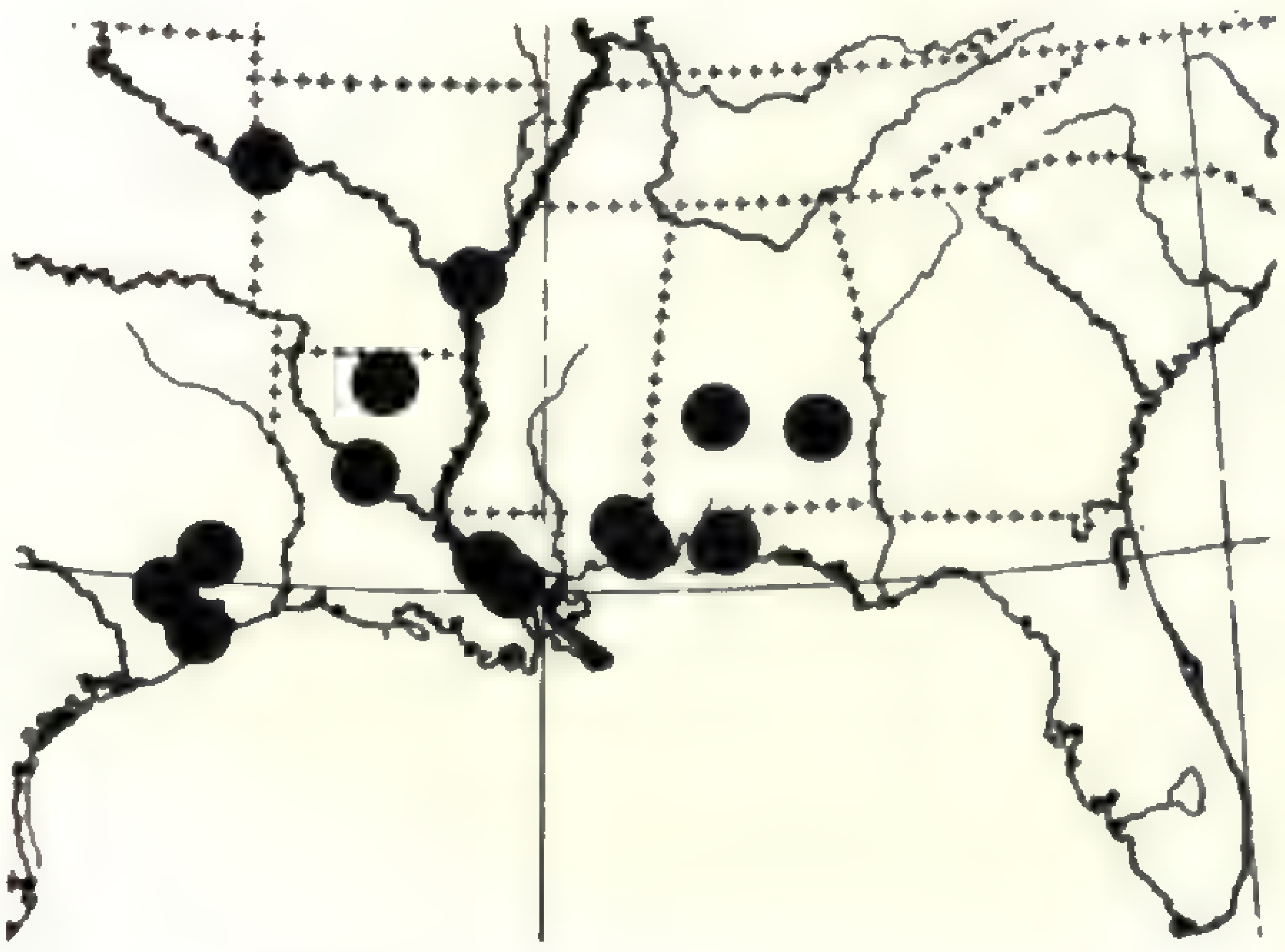
In Mexico and Central America several species, otherwise very distinct, coexist with the production of some very closely similar entities. To judge from available material, these entities are actually quite distinct but the points of distinction are minute. *C. peploides* var. *peploides*, of southern United States and northeastern Mexico, admits of no confusion with *C. deflexa* var. *subsessilis*—compare Figs. 7a and 2b. In *C. peploides* var. *semialata* there is a more or less close approach to *C. deflexa*, in that the strumose base of the fruit is less developed and there is a wing at the summit of the mericarp (Fig. 7b). Extreme individuals of *C. peploides* var. *semialata*, with the bases of the mericarps only very slightly twisted, so that the face of the fruit is nearly as flat as that of *C. deflexa* var. *subsessilis*, may be positively distinguished by the wing: in *C. peploides* var. *semialata* only the summit of the mericarp is winged, while in *C. deflexa* var. *subsessilis* the wing extends to and somewhat around the base of the mericarp.

C. peploides var. **media,** n. var.[1], base of mericarps only slightly twisted so that the fruit is a little strumose at base (Figs. 7c, 7d); margin of mericarps thickened and with a narrow wing turned outward.—**Guatemala:** near Cobán, Dept. Alta Verapaz, alt. 1260–1440 m., March 26–April 15, 1939, *Standley 70448* (Type in Chicago Natural History Museum); Dept. Quezaltenango, Aguas Amargas, alt. about 2450 m., Jan. 14, 1941, *Standley 83331* (cm); Dept. Quezaltenango, above Mujuliá, between San Martín Chile Verde and Colomba, alt. about 1800 m., Feb. 1, 1941, *Standley 85717* (cm); Dept. Quezaltenango, Río Samalá, opposite Santa María de Jesús, alt. 1500 m., Jan. 21, 1940, *Steyermark 35073* (cm); Dept. Huehuetenango, above Macx, between Todos Santos and San Martín, Sierra de los Cuchumatanes, alt. 2500–3000 m., Sept. 6, 1942, *Steyermark 51930* (cm); Chichivac, Dept. Chimaltenango, alt. 2400–2700 m., Nov. 7, 1933, *Skutch 657* (us); Cobán, Alta Verapaz, 1908, *Türckheim 2066* (us). **Costa Rica:** La Hondura, Prov. San José, alt. 1300–1700 m., March 2–4, 1924, *Standley 36203* (us, cm).

C. peploides var. *media* approaches *C. deflexa* var. *subsessilis* on the one hand, and *C. Nuttallii* on the other. The wing, while less developed down the sides and base of the mericarp, is turned outward as may be observed on some young fruits of *C. deflexa.*

[1] **C. peploides** var. **media,** var. nov., fructibus ad basem substrumosis; marginibus incrassatis cum ala recurvata. Cobán, Guatemala, March 25–April 15, 1939, *Standley 70448*, Type in Chicago Natural History Museum.





5 (middle left). *C. sepulta.* 6 (lower right). *C. Nuttallii.* 7 (above). *C. peploides*, var. *peploides* (dots), var. *semialata* (crosses), and var. *media* (x's). 8 (lower left). *C. occidentalis.*

The thickened edge of the mericarp, rimmed with the slightly developed wing turned at right angles to the face (Fig. 7d) is suggestive of *C. Nuttallii* (Fig. 6a).

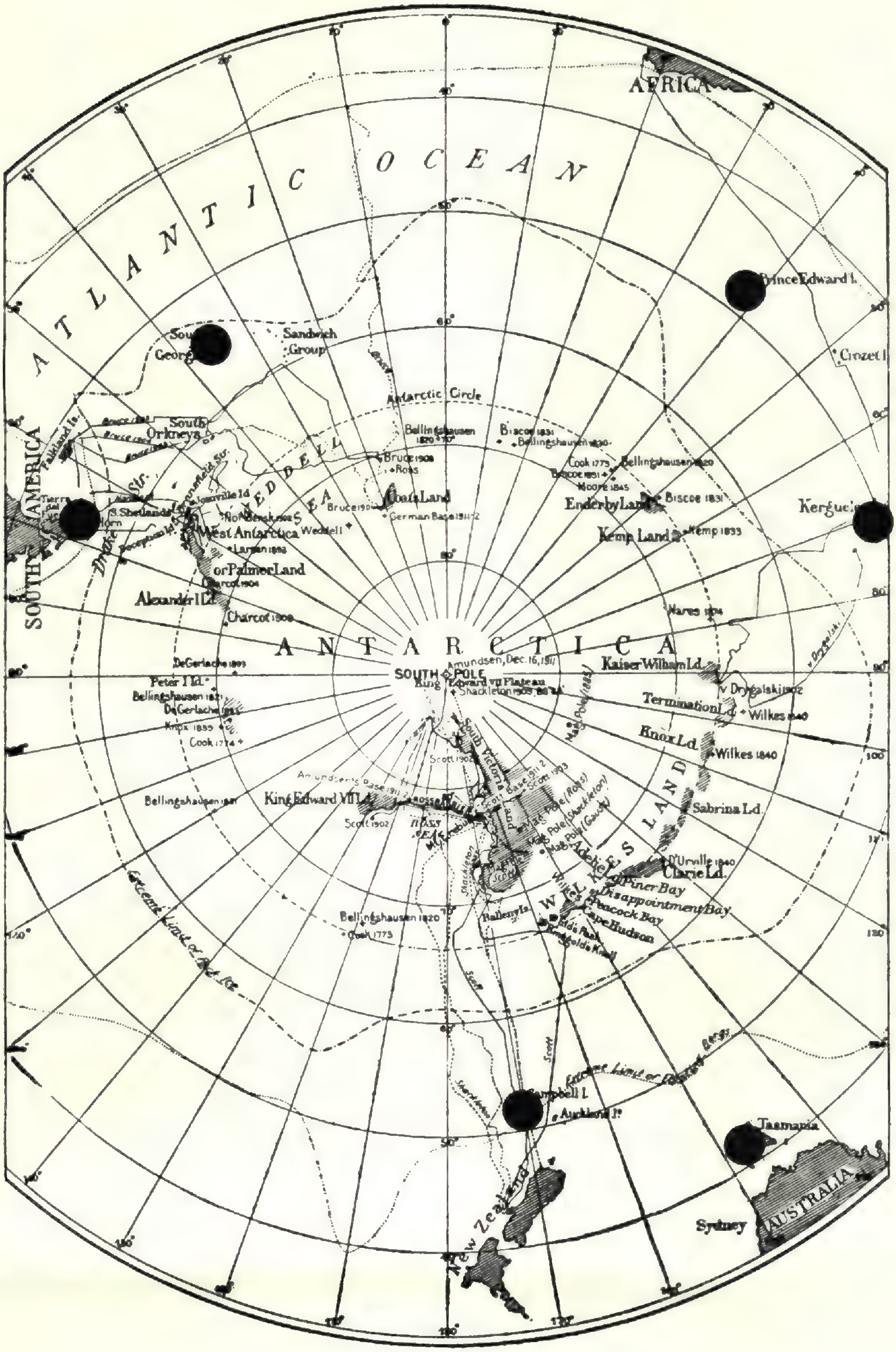
8. **C. occidentalis** Hegelm. Monographie Gattung Callitriche 57. 1864; Hegelm. Verhandl. Bot. Ver. Brandenburg 9: 14. 1867. *C. microcarpa* Engelm. ex Hegelm. Verhandl. Bot. Ver. Brandenburg 10: 113. 1869.—Fruit 0.3–0.4 mm. wide, usually a little higher, with rather straight sides, narrowed toward the base (Fig. 8); mericarps with lower ends pushing against each other and bending outward so that the fruit appears strumose at base; stigmas nearly obsolete, usually persisting as minute stubs scarcely exserted between the upper lobes of the mericarps; filaments 0.1–0.2 mm. long; anthers minute, less than 0.1 mm. wide; leaves 2–5 mm. long, obovate to oblanceolate, faintly 1–3-nerved.—Known only from **Cuba**: Chirreva, July 28, 1860–64, *Wright 2547* (GH, MO); Los Remates, Dec. 26, 1860–64, *Wright 2548*, ISOTYPE of *C. microcarpa* (GH, MO); fl. St. John, Matanzas, *Rugel 234bis* (NY—mixed with *C. peploides*); Playa de Mariano, Prov. Havana, Feb. 22, 1910, *Britton & Wilson 4515* (NY); Trinidad Mts., Santa Clara, Los Cocos to Rio Negro, 430 meters alt., March 6, 1910, *Britton & Wilson 5127* (NY).

No material was cited with the original description of *C. occidentalis*, but in 1867 a single collection was cited: Cuba ("in paludosis exsiccatis Masmarisen, April 1824" K. K. W. H.).

C. microcarpa was based on *Wright 2548*, which seems inseparable from the other collections of *C. occidentalis*. Dr. Engelmann's carefully mounted stems (MO) show several fruits, and their identity is unmistakable.

9. **C. antarctica** Engelm. ex Hegelm. Verh. Bot. Ver. Brandenburg 9: 20. 1867.—Fruit almost round (Fig. 9b), 1.1–1.3 mm. wide; mericarps with rounded edges and flat faces; stigmas 1.4–2.7 mm. long; anthers 0.5–1.5 mm. wide, on filaments up to about 1 cm. in length; stems fleshy and stout, blackening in drying, creeping below, with ascending or erect branches 2–6 cm. long and often branching at the nodes; leaves at lower rooting nodes reduced to scarious spatulate evanescent scales; upper leaves 2.3–6.5 mm. long, 1.3–1.7 mm. wide, 3-nerved, apparently rather fleshy and often blackening in drying, broadly rounded above, with wide scarious bases connected by a broad wing (Fig. 9a); peltate scales often abundant and conspicuous, especially about the nodes.—Probably terrestrial, on islands from 40° South to Antarctica.—Bay of Isles, South Georgia Island, Feb. 3, 1913, *Murphy 1764* (NY). Hermit Island, Cape Horn, *Hooker* (MO). Campbells Island, *Hooker* (cited by Hegelm., l. c.). Tasmania, *Gunn* (MO). Kerguelen's Land, *Kidder* (NY, CM, US, MO, GH); Kerguelen's Land, *Hooker*, COTYPE (MO, GH). Marion Island, Dec. 5, 1874, *Mosely* (GH). Antarctic America, *Hooker*, COTYPE (GH, MO).

10. **C. verna** L. emend. Kütz., and most modern European authors. *C. palustris* L. emend. Britton & Brown, and of many North American authors. The original description of Linnaeus, and many following, of which a few are cited here, were completely ambiguous, only the foliage being described in detail. The following names, then, apply only to the Section *Callitriche* in



9. *C. antarctica.*

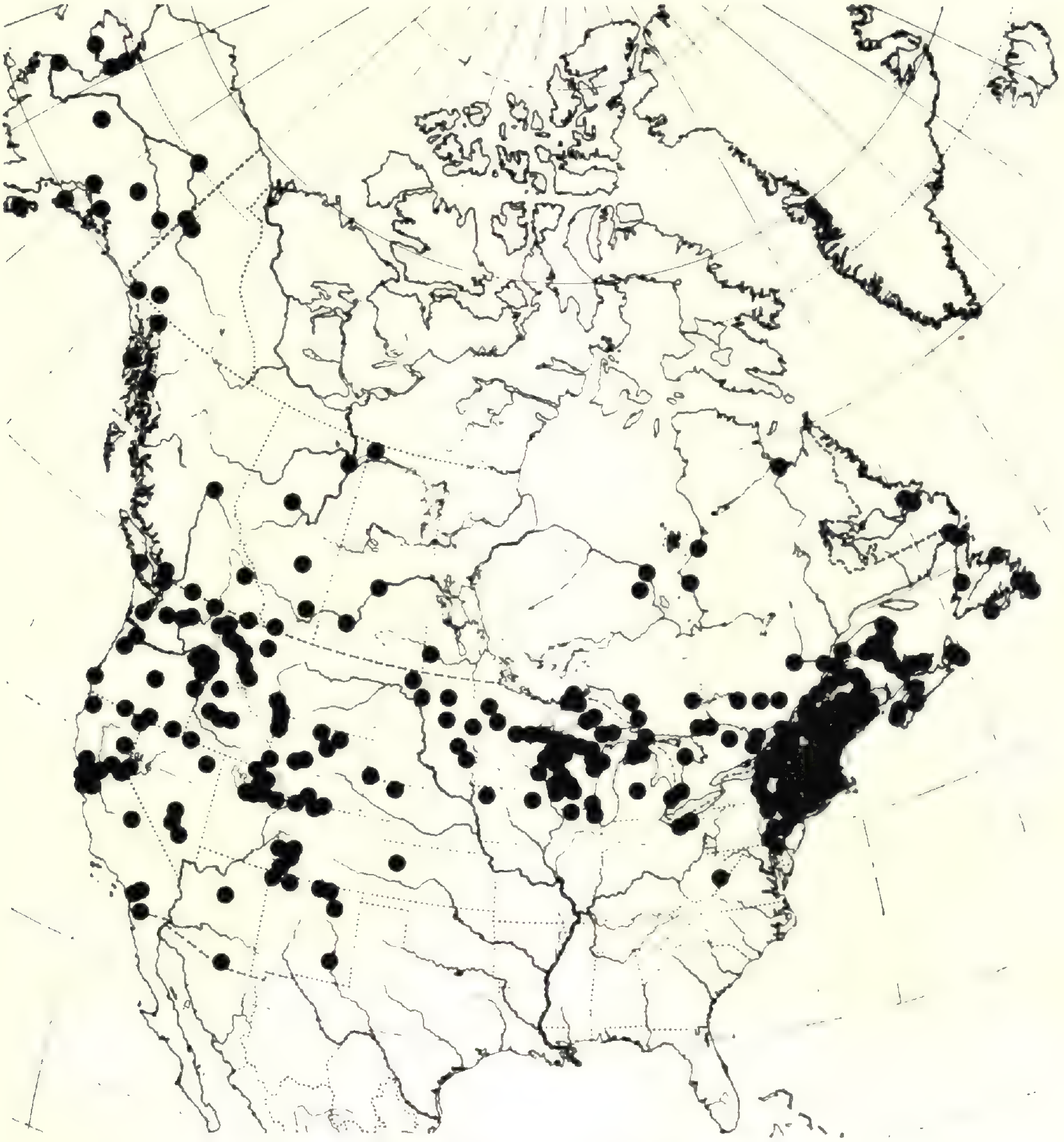
general: *C. verna* L., Fl. Suec. ed. 2: 2. 1755; Sp. Pl. ed. 2, 1: 6. 1762; Oeder, Fl. Dan. 1: t. 129. 1764; Michx. Fl. Bor.-Am. 1: 2. 1803; Wahlenb. Fl. Lap. 2: 1812; R. & S. Syst. 1: 46. 1817; Spreng. Syst. ed. 16, 1: 20. 1817; DC. Prod. 3: 70. 1828.

The first name clearly applicable to species no. 10 of the present treatment was *C. verna* as used by Kützing, who described the fruit, and as used by most European and many American authors since his time: *C. verna* Kütz. in Reichenb. Pl. Crit. Cent. IX. Tab. 881. 1831; Kütz. Linnaea 7: 175. 1832; Kütz. in Reichenb. Icones V. Tab. cxxli. fig. 4746. 1841; Lönnroth, Obs. Crit. Pl. 17. 1854; Hegelm. Monogr. Callit. 55. 1864; Hegelm. Verhandl. Bot. Ver. Brandenburg 9: 22. 1867; Howell, Fl. N. W. Am. 218. 1897; Samuelsson, Festschrift Carl Schröter 623. 1925; Pearsall, Bot. Soc. & Exch. Club Br. Isles 10: 863. 1935; Glück in Pascher, Süsswasser-Flora Mitteleuropas 15: 288. 1936; Hultén, Fl. Aleutian Islands 238. 1937.

C. palustris L. Sp. Pl. 2: 969. 1753 was also based on foliage only, and is completely ambiguous as to application. It was revived by Morong, Mem. Torrey Club 5: 215. 1894, based on *C. verna.* Were *C. verna* L. and *C. palustris* L. exactly synonymous it might be argued that the application of *C. verna* as fixed by Kützing automatically fixed that of the older *C. palustris*, but since the descriptions and synonyms of these two names were not exactly the same, each must stand on its own feet. The first recognizable description of *C. palustris* was in Britton & Brown, Ill. Fl. 2: 382. 1897, and the name has been taken up by several subsequent American authors including: Small, Fl. S. E. U. S. 723. 1903; Robinson & Fernald in Gray's Manual, ed. 7: 550. 1908; Coulter & Nelson, New Man. Rocky Mt. Bot. 312. 1909; Henry, Fl. S. Br. Col. 200. 1915; Rydb. Fl. Rocky Mts. 548. 1917; Munz, Man. S. Calif. Bot. 291. 1935; Jepson, Fl. Calif. 2: 434. 1935; Fassett, Man. Aquat. Pl. 241. 1940; Peck, Man. Higher Pl. Ore. 466. 1941; Muenscher, Aquat. Pl. U. S. 261. 1944; Roland, Fl. N. S. 342. 1947; Fernald in Gray's Man. ed. 8: 973. 1950. *C. stenocarpa* Hegelm. Verhandl. Bot. Ver. Brandenburg 10: 114. 1869. See discussion under *C. longipedunculata.*

Fruit 0.6–1.4 mm. wide, the height always exceeding the width, the width greatest above the middle (Fig. 10a, d, g, i, l, n, q, t), the thickness at base greater than at summit (Figs. 10c, f, j, k, o, r, u); face of mericarps sharply reticulate, the reticulations appearing more or less clearly in vertical rows (Figs. 1 & 2 on Plate 1167); margins of carpels widely spreading (Figs. 10b, e, h, m, s) with a definite scarious wing that is always widest at summit and runs a greater or lesser distance down the sides; leaves very variable, the lower submersed ones often linear, 0.3–1.0 mm. wide, 1-nerved, shallowly bidentate at apex (Fig. 10w), the upper ones often dilated (Figs. 10g, p), and the terminal frequently in a floating rosette, but various intermediates present on many plants. Young fruits of *C. verna*, when pressed, sometimes widen as they flatten, to simulate in outline those of *C. heterophylla.*—In shallow water or stranded on the mud, from Greenland to Alaska, south to southeastern Pennsylvania and northeastern Maryland, and in the mountains to West Virginia, northern Ohio, southern Michigan, northern Illinois, northern Iowa, western Nebraska, western Kansas, southern New Mexico, southern Arizona, and southern California, perhaps in Mexico; Europe; Asia.—Relatively few of the many collections examined are cited below.

Greenland: Jakobshavn, Aug. 3, 1937, *Porsild 411* (GH, NY, US); Godhavn, July 27–28, 1937, *Porsild 294* (GH). **Labrador:** Straits of Belle Isle, Blanc Sablon River, Sept. 3, 1925, *Fernald, Wiegand & Long 28639* (GH). **New-**



10. *C. verna*, range in the New World.

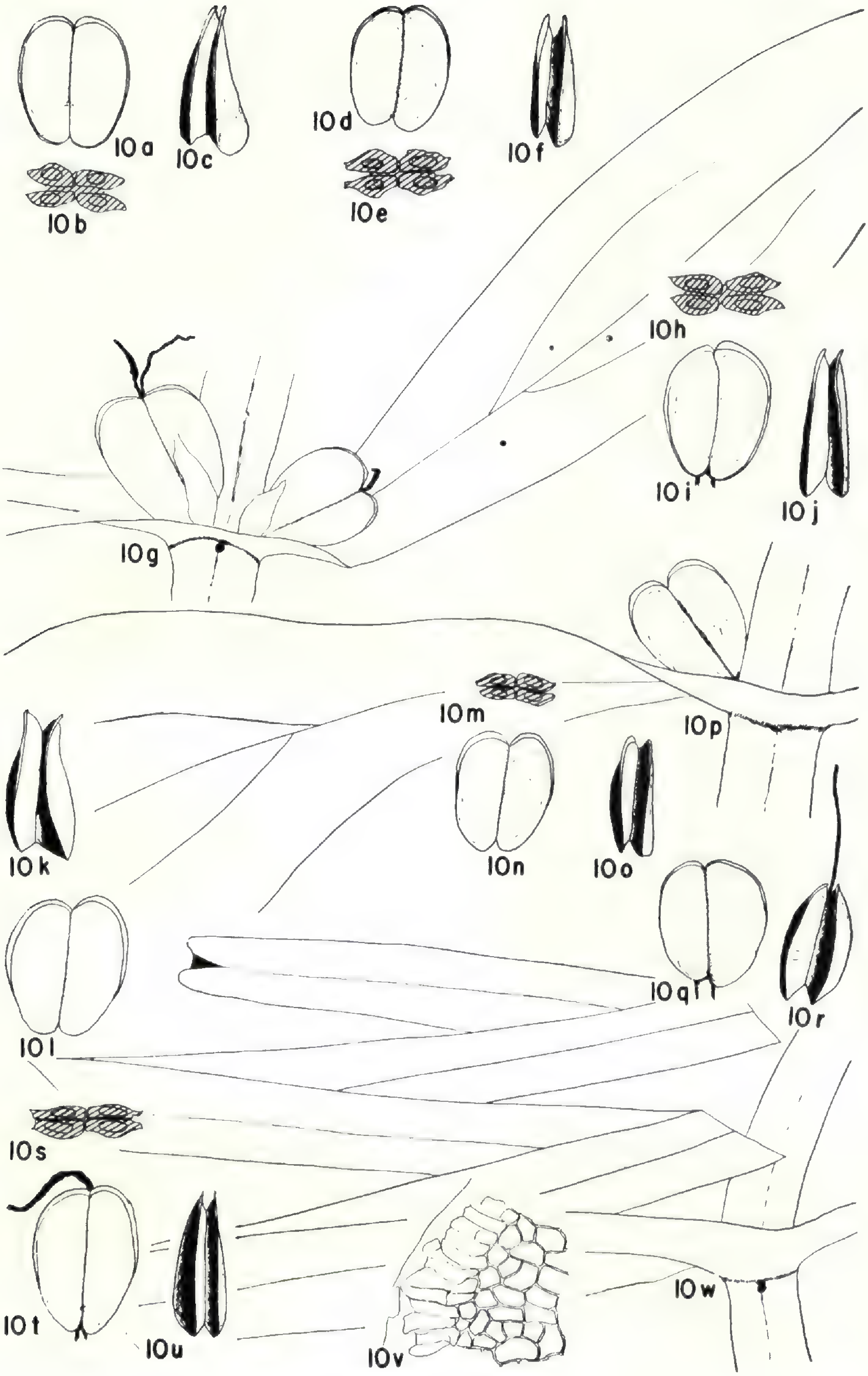
foundland: Quiddy Viddy Lake, Aug. 2, 1894, *Robinson & Schrenk 229* (US, NY, GH, CM); Bay of Islands, 1896, *Waghorne 37* (MO); Trepassy, Avalon Peninsula, Aug. 16, 1924, *Fernald, Long & Dunbar 26819* (GH). **St.-Pierre et Miquelon:** St.-Pierre, Aug. 17, 1901, *Arsène 328* (GH). **Quebec:** Lake Memphremagog, Aug. 16, 1886, *Churchill* (GH); Bic, Rimouski Co., July 22, 1907, *Fernald & Collins 1111* (GH); Cap à L'Aigle, July 18, 1905, *Macoun 67928* (GH); 113 miles north of Mont-Laurier, Aug. 3–5, 1941, *Victorin, Rolland & Blain 126* (MO, GH); Thetford, Megantic Co., Aug. 5, 1920, *Victorin 11250* (US, GH); Cascapedia River, Bonaventure Co., Aug. 29, 1947, *Fassett 27795* (WIS). **Prince Edward Island:** Southport, Queens Co., July 9, 1912, *Fernald & St. John 7726* (US, GH). **New Brunswick:** St. Andrew's, Aug. 7, 1900, *Fowler* (US, GH); Grande Anse, Aug. 22, 1913, *Blake 5518* (US, MO, GH).

Nova Scotia: Grand Pré, July 10, 1901, *Howe & Lang 371* (NY); George River, Cape Breton Co., Aug. 29, 1920, *Bissell & Linder 21765* (GH); Middleton, Annapolis Co., July 21, 1920, *Fernald & Pease 21762* (GH). **Maine:** Van Buren, July 22, 1893, *Fernald 46* (CM, US, MO, GH, UC, NY); Mt. Desert, Aug. 17, 1892, *Redfield 16704* (MO); York, Aug. 12, 1894, *Bicknell 5575* (NY). **New Hampshire:** Jackson, Aug. 1, 1890, *Churchill* (MO); Hanover, July 12, 1910, *Williams* (GH, MO); Errol, Coös Co., Sept. 5, 1917, *Fernald & Pease 17075* (NEBC); Peterboro, Hillsboro Co., Aug. 25, 1927, *Batchelder* (NEBC—approaching *C. heterophylla*). **Vermont:** Burke Swamp, Stowe, July 3, 1884, *Knight* (NY). **Massachusetts:** Saugus, Essex Co., Oct. 14, 1938, *Svenson 3002* (GH); Sheffield, Berkshire Co., July 8, 1920, *Churchill* (GH, MO). **Connecticut:** Bridgeport, July 9, 1899, *Eames 93* (GH). **New York:** Orange Co., July, 1864, *Austin* (MO, CM); Cedarville, Herkimer Co., *Paine* (MO); Utica, June, 1895, *Haberer 782* (GH); Clove, Dutchess Co., Sept. 2, 1915, *Standley & Bollman 12304* (US). **New Jersey:** Closter, several collections in 1864 & 1865, *Austin* (MO, NY). **Pennsylvania:** Northampton, Aug. 29, 1923, *Churchill* (GH); McCalls Ferry, York Co., July 5–7, 1904, *Rose & Painter 8172* (US). **Maryland:** Havre de Grâce, Sept. 20, 1902, *Shull 405* (US, NY); Notley Hall, 1894, *Coville 35* (US). **West Virginia:** Blister Swamp, Pocahontas Co., Aug. 12, 1931, *Core* (NY). **Ontario:** Golden Lake, July 26, 1899, *Umbach* (US, CM); North Bay, Nipissing Co., Aug. 16, 1933, *Victorin, Rolland & Meilleur 45345* (GH); Schreiber, Thunder Bay District, Aug. 31, 1937, *Hosie, Losee & Bannan 1441* (GH). **Ohio:** Florence, Erie Co., Aug. 28, 1895, *Mosely* (US). **Michigan:** Rumley, Alger Co., July 27, 1936, *Hermann 8290* (US, NY); Fort Gratiot, Nov. 20, 1870, *Gillman* (MO); Ironwood, July 28, 1909, *Clemens* (US). **Wisconsin:** Fort Howard [Green Bay], Aug. 28, 1890, *Schuette* (NY, CM, GH); Long Lake, Portage, Columbia Co., Sept. 29, 1945, *Fassett 22305* (US, WIS). **Illinois:** Glencoe, July, 1912, *Sherff* (MO); Fountaindale, 1871, *Bebb* (CM). **Minnesota:** Squaw Lake, Itasca Park, Clearwater Co., July 13, 1933, *Moyle 854* (US, NY, CM, UC, MO, GH); Milaca, Mille Lacs Co., July, 1892, *Sheldon* (US, GH). **Iowa:** Clay Co. 7 miles east of Ruthven, Aug. 13, 1935, *Hayden 9558* (US, NY, MO, GH); Jessup, Oct. 27, 1893, *Everman* (CM). **Manitoba:** Hamiota, June 23, 1906, *Macoun & Herriot* (CM, NY, GH). **North Dakota:** Leeds, several collections in 1901 & 1902, *Lunell* (GH, NY); Bloom, June 15, 1911, *Bergman 166* (CM). **South Dakota:** Kirk, Black Hills, Aug. 27, 1910, *Murdoch 4338* (GH, CM, NY); Custer, Black Hills, July 25, 1892, *Rydberg 571* (GH, US, NY). **Nebraska:** Kennedy, July 8, 1891, *Bates* (GH). **Saskatchewan:** Yorkton, July 7, 1906, *Macoun & Herriot 72363* (CM, NY); Saskatoon, June 26, 1934, *Fraser*

Plate 1172

(Numbers same as in keys and descriptions)

10. *C. verna*. 10a. Face of fruit, × 30. California, *Wheeler 3803* (US). 10b. Cross-section of fruit, × 30. Same collection. 10c. Edge view of fruit, × 30. Same collection. 10d. Face view of fruit, × 30. Maryland, *Coville 35* (US). 10e. Cross-section of fruit, × 30. Same collection. 10f. Edge view of fruit, × 30. Same collection. 10g. Portion of stem and leaves, 2 fruits, each with a bract, × 30. Michigan, *Clemens* (US). 10h. Cross-section of fruit, × 30. Same collection. 10i. Face of fruit, × 30. Same collection. 10j. Edge view of fruit, × 30. Same collection. 10k. Edge view of fruit, × 30. Alaska, *Trelease 43796* (US). 10l. Face view of fruit, × 30. Same collection. 10m. Cross-section of fruit, × 30. Japan, *Nakobe* (US). 10n. Face view of fruit, × 30. Same collection. 10o. Edge view of fruit, × 30. Same collection. 10p. Portion of stem, leaves, and a fruit, × 30. Same collection. 10q. Face view of fruit, × 30. Sweden, *Lindstrom* (GH). 10r. Edge view of fruit, × 30. Same collection. 10s. Cross-section of fruit, × 30. Quebec, *Marie-Victorin 11250* (US). 10t. Face of fruit, × 30. Same collection. 10u. Edge view of fruit, × 30. Same collection. 10v. Portion of wing and face of fruit, × 187.5. New Brunswick, *Fowler* in 1900 (US). 10w. Portion of stem with linear 1-nerved submersed leaf, × 30. Quebec, *Marie-Victorin 11250* (US).



CALLITRICHE VERNA

(CM). **Alberta:** Fort McMurray, junction of Athabaska and Clearwater Rivers, Sept. 11, 1935, *Raup 7097* (GH); Wolf Creek, Craigmyle District, Aug. 15, 1925, *Brinkman 1839* (US—mixed with *C. hermaphroditica*). **Montana:** Chestnut, vicinity of Bozeman, Sept. 23, 1905, *Blankinship 187* (US, CM); Glacier National Park, Aug. 9, 1932, *Maguire 902* (GH). **Wyoming:** Pinedale, Sublette Co., July 23, 1922, *Payson & Payson 2805* (US, CM, MO, GH, UC); Ranchester, July 13, 1896, *Nelson 2288* (MO). **Colorado:** Empire, Aug., 1874, *Engelmann* (MO, GH); Chicken Creek, W. La Plata Mts., June 27, 1898, *Baker, Earle & Tracy 151* (US, CM, NY, MO); Breckenridge, Summit Co., Aug., 1901, *Mackenzie 359* (MO). **New Mexico:** Pecos River National Forest, Aug. 11, 1908, *Standley 4889* (US, GH, NY); Chama, Rio Arriba Co., July 9, 1911, *Standley 6660* (US). **Idaho:** Alturas Lake, Blaine Co., Aug. 11, 1916, *Macbride & Payson 3726* (US, NY, MO, GH, UC); Forks of St. Mary's River, Coeur d'Alene Mountains, July 6, 1895, *Leiberg 1175* (US, CM, NY, GH, UC, MO). **Utah:** Big Cottonwood Cañon, below Silver Lake, July 11, 1905, *Rydberg 6885* (US, NY); Uintas, July, 1869, *Watson 391* (NY, GH), and Aug., 1869, *390* (US, NY). **Arizona:** Tucson, April, 1881, *Lemmon Herbarium* (US, NY, MO, GH); Flagstaff, July, 1889, *Greene* (NY). **Alaska:** Bell Isl., Sulphur Springs, Aug. 22, 1915, *Walker 955* (US, CM, NY); Unga, Shumagin Islands, July 16, 1899, *Saunders 4379c* (US); Sitka, July 10, 1914, *Anderson 97* (US). **Yukon:** White Horse, Sept. 2, 1902, *Macoun 58511* (NY). **British Columbia:** Barclay Sound, Vancouver Island, Aug. 8, 1887, *Macoun* (NY); Lake Osoyoos, between Lat. 49° and 49° 50′, and Long. 119° 20′ and Long. 119° 35′, May 31, 1905, *Macoun 79520* (NY). **Washington:** Usk, July 30, 1902, *Kreager 352* (US, NY, GH); Leavenworth, Aug. 26, 1901, *Umbach* (CM, NY). **Oregon:** Farewell Bend, Crook Co., July 17, 1894, *Leiberg 459* (US, NY, GH, CM, UC); Keno, Klamath Co., July 8, 1920, *Peck 9389* (MO, GH, NY). **Nevada:** Park's Station, 25 miles north of Elko, Aug. 3, 1913, *Hitchcock 978* (US, NY, MO, GH); Toiyabe National Forest, Nye Co., July 15, 1945, *Maguire & Holmgren 25786* (NY, GH). **California:** Warner Mts., Modoc Co., Aug. 15, 1935, *Wheeler 3863* (US, NY, MO, GH); Russian River, Sonoma Co., 1864, *Bolander 3870* (US); Julian, San Diego Co., June, 1882, *Parish 1404* (CM). **Mexico:** Colipa, Dep. Vera Cruz, "reg. calid.", March, 1841, *Liebmann 1086* (GH—the collection was identified by Ostenfeld as *C. deflexa β. Austini*, and is so far from the rest of the range of *C. verna* that the possibility of a confusion of labels must be considered, particulary in view of the fact that this number in UC is *C. peploides* var. *semialata*).

11. **C. albomarginata**, n. sp., fructibus 0.9–1.0 mm. latitudine, 1.0–1.5 mm. altitudine, altitudine latitudinem plerumque maiore; carpellis manifeste reticulatis fuscis, cum ala alba distincta; foliis 4–6 mm. longis, 1–2 mm. latis, obovatis, subpetiolatis.—Fruits 0.9–1.0 mm. wide, 1.1–1.5 mm. high, usually a little higher than wide (Fig. 11a); commissural groove about as wide as deep (Figs. 11b, 11c); face of carpels clearly reticulate and dark-colored, clearly differentiated from the whitish wing at summit of fruits and often also at the base and slightly developed down the sides; leaves 4–6 mm. long, 1–2 mm. wide, the blades obovate or subrotund, tapering to long margined petioles; upper leaves in a floating rosette.—**Chile:** Cordillera de Santiago, 2700 m. alt., March, 1899, *Reiche* (GH).

Although represented by but one small specimen, this appears to be a very distinct species. The fruits are usually a little narrower toward the base than toward the summit, but a few

have nearly parallel sides. Only rotund leaves are represented on the type specimen, which looks enough like Fig. 4 on Plate 1169 to have served as its original, but of course leaves of other types may be expected in almost all members of the Section Callitriche.

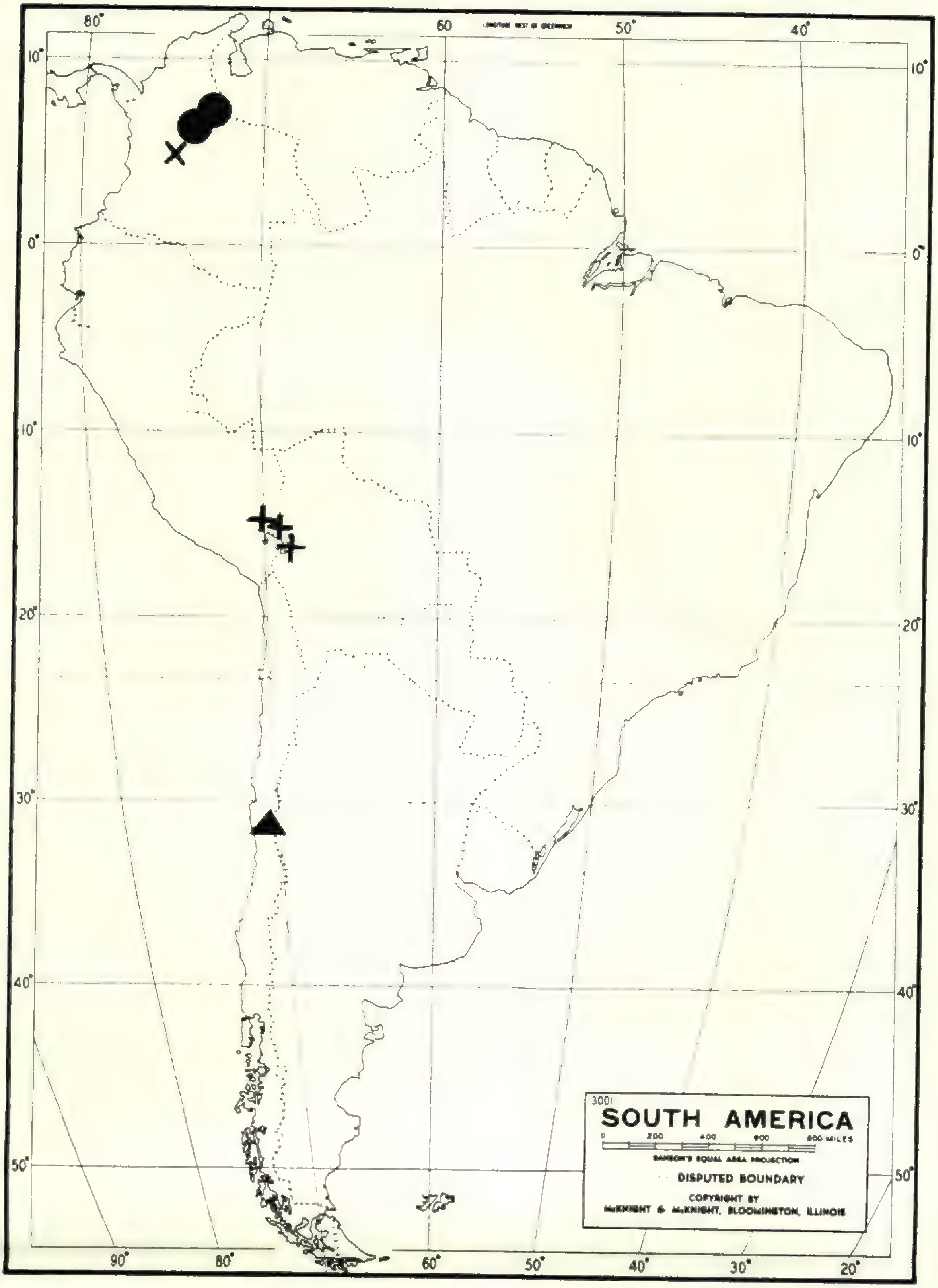
12. **C. heteropoda** Engelm. ex Hegelm. Verh. Bot. Ver. Brandenburg 9: 40. 1867. Fruit 1.2–1.4 mm. wide, 1.2–1.5 mm. high, the height equalling (Fig. 12c) or slightly exceeding (Fig. 12g) the width; edges of carpels wingless, rounded or very obtusely angled (Figs. 12b, 12d, 12e, 12h) with a broad V-shaped commissural groove between them; fruit sessile or on pedicels up to 15 mm. long on the same plant; leaves linear and 1-nerved below and broadly ovate above, or all of the ovate-rotund type, or, when plants are stranded on shore, oblong and of firmer texture.—High mountains of southeastern Peru and northwestern Bolivia.—**Peru**: pools in Distichia moor, 4200–4500 m. alt, La Raya, Department of Cusco, April 22, 1925, *Pennell 13493* (GH, CM). **Bolivia**: Prov. Larecaja, vic. Sorata, in lacunis uliginosis, 1859 and/or 1860, *Mandon 1496* and/or *1456* (TYPE in MO, ISOTYPES in MO, GH, NY); without locality, *Bang 1887* (GH, US, NY, CM, MO); LaPaz, Dec. 29, 1930, *Buchtien 8436* (US); Tunari, April 5, 1892, *Kuntze* (NY).

The variations in leaf-patterns almost exactly parallel those of *C. heterophylla* as illustrated in Plate 1168. The leaves may be even larger than in that species and reach 5 mm. in width in the *Bang* collection.

Young fruits, when pressed very flat, may appear obscurely winged, but mature fruits on the same plant serve to dispel the illusion.

It is difficult to determine whether there are two Mandon collections, or if there is but one. The sheet in NY bears clearly the number *1456* and the date 1860. The sheet in GH has, in less legible figures, the number *1456* and the date 1859. The two sheets in MO have no date (except "ex Hb. A. Gray 1865" on one mounted fragment): one sheet is numbered *1496*, and has in a pocket mounted fragments two of which are marked, respectively, *1496* and *1496a;* the other is labelled, "mixta cum no. *1496*." Engelmann at one time had separated the two sheets as different species, but eventually published them as one.

13. **C. heterophylla** Pursh emend. Darby. *C. heterophylla* Pursh, Fl. Amer. Sept. 1: 3. 1814, *nomen ambiguum;* Darby, Bot. Southern States 311. 1841; Engelm. in Gray's Manual ed. 5: 429. 1867; Hegelm. Verhandl. Bot. Ver. Brandenburg 9: 20. 1867; Britton & Brown, Ill. Fl. 2: 382. 1897; Small, Fl. Southeastern U. S. 723. 1903; Howell, Fl. N. W. Am. 218. 1918, in part; Robinson & Fernald in Gray's Manual ed. 7: 550. 1908; Rydb. Fl. Prairies &



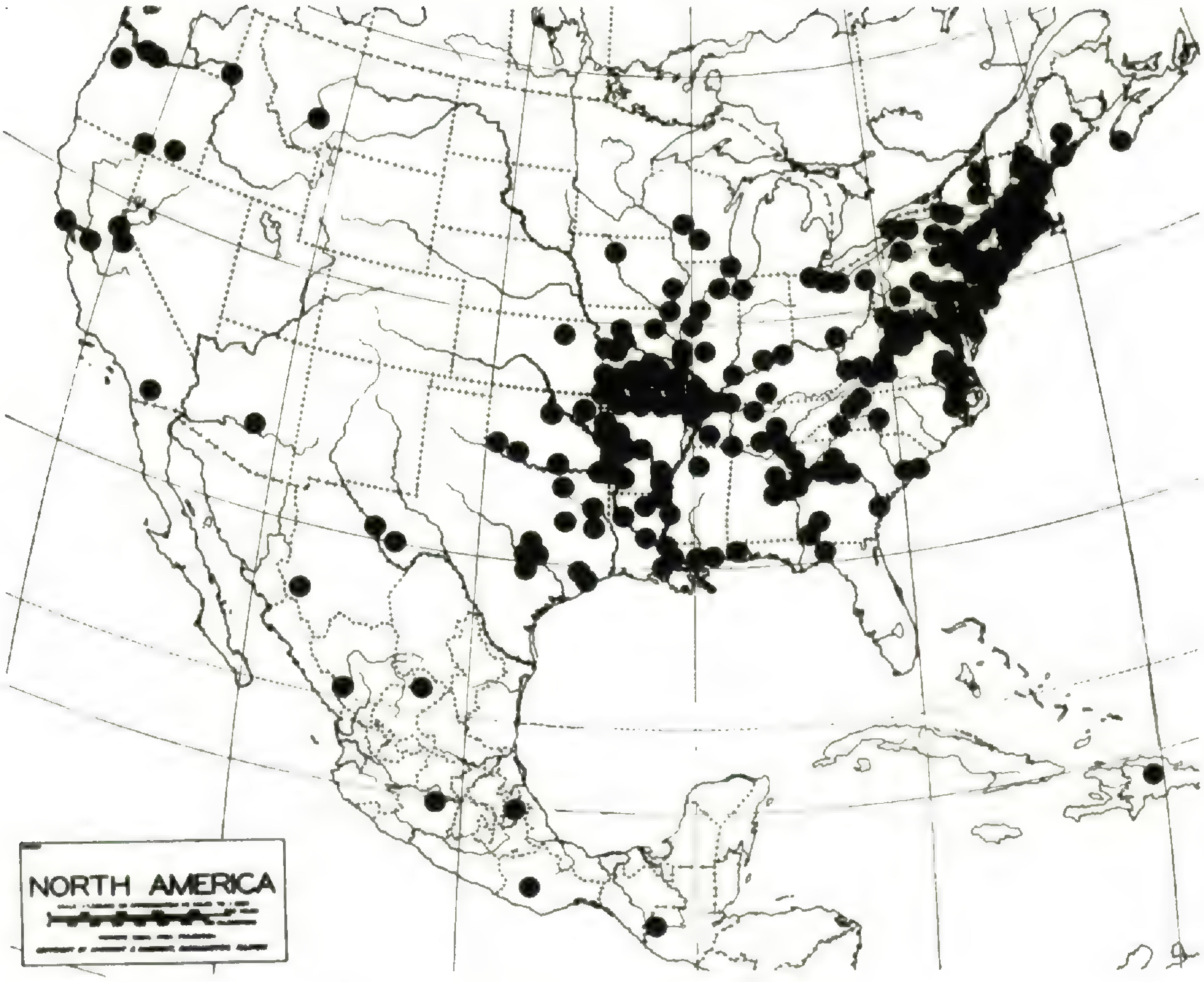
11. *C. albomarginata* (triangle). 12. *C. heteropoda* (crosses). 14. *C. quindiensis* (x). 17. *C. nubigena* (dots).

Plains 522. 1932; Fassett, Man. Aquat. Pl. 241. 1940; Muenscher, Aquat. Pl. U. S. 260. 1944; Fernald, Gray's Manual, ed. 8: 974. 1950. *C. Asagraei* Hegelm. Monogr. Gattung Callitriche 54. 1864. *C. Tuerckheimii* Urb. Symb. Ant. 7: 265. 1912.—Fruit 0.6–1.2 mm. wide, the height equalling the width (Figs. 13a, 13j, 13x, 13Ag, 13Ak), or not more than 0.1 mm. greater (Figs. 13d, 13Aa, 13Ae, 13Ap) or 0.1 mm. less (Figs. 13e, 13m, 13w, 13Ag) than the width; carpels more broadly rounded at summit than at base so that the outline of the fruit is slightly heart-shaped (all figures listed above), convex on the face and thickest just above the base (Figs. 13b, 13f, 13k, 13n, 13r, 13Ab, 13Ai, 13Aq); margins of fruits wingless or rarely with a very narrow wing (Figs. 13i, 13p, 13v, 13z) at the summit; styles 1–6 mm. long, erect or spreading, persistent or caducous; leaves of many types, often linear and one-nerved at the lower nodes with a rosette of floating obovate leaves (Figs. 4 & 9 on Plate 1168), or all linear, or all obovate, or oblong on plants stranded on the mud (Figs. 1 & 6 on Plate 1168); linear one-nerved leaves shallowly bidentate at tip with an enlarged but scarcely excurrent nerve-ending (Figs. 13h, 13s, 13An, 13Ao).

a. Fruits (0.6–) 0.7–0.8 (rarely –1.0) mm. wide and high .... *C. heterophylla* var. *heterophylla.*
a. Fruits (0.8–) 0.9–1.1 (–1.2) mm. high and wide .... *C. heterophylla* var. *Bolanderi.*

C. heterophylla var. **heterophylla.** *C. heterophylla* Darby, l. c., and probably of Pursh, l. c. *C. Asagraei* Hegelm. l. c.—Southwestern Nova Scotia and central Maine to Florida and Dominican Republic, westward through northern New York, southern Ontario, northern Ohio, northern Illinois and Iowa, rarely to southcentral Wisconsin, and southward with a western border in Kansas, Oklahoma and Texas, to Guatemala; in the western states from western Montana and central Arizona to Washington, Oregon and California where it grades into the more abundant var. *Bolanderi.*—Only a few of the many collections are cited here. **Nova Scotia:** Rockville, Yarmouth Co., July 14, 1920, *Pease & Linder 21760* (GH). **Maine:** Chemo Stream, July, 1895, *Harvey 345(1)* (US); North Berwick, July 17, 1891, *Parlin* (GH, NEBC). **New Hampshire:** Gorham, Sept. 14, 1916, *Pease 16863* (NEBC—approaching *C. verna*); West Ossipee, Sept. 21, 1855, *Boott* (NEBC); Head Pond, Berlin, Aug. 4, 1920, *Pease 17827* (NEBC); Walpole, July 13, 1901, *Fernald 231* (NY, US, MO, GH, UC, CM). **Massachusetts:** Charles River near Riverview, July, 1895 (GH); Waverly, Aug. 15, 1892, *Harper* (WIS); Ashland, July 21, 1877, *Morong* (MO); Chilmark, Martha's Vineyard, June 19, 1917, *Seymour 1261* (NY, GH); Harwich, Barnstable Co., Aug. 13, 1918, *Fernald & Long 17043* (NEBC—approaching *C. anceps*); Deerfield, *Herb. Torrey* (MO). **Rhode Island:** East Providence, Phillipsdale, June 2, 1906, *Reynolds 068* (GH); Providence, May 8, 1892, *Collins* (US). **Connecticut:** Southington, Aug. 21, 1895, *Andrews* (GH); Franklin, June 23, 1906, *Woodward* (GH). **New York:** Wading River, Long Island, July 23, 1877, *Miller* (MO, US); Sand Lake, near Albany, 1863, *Austin* (MO); Caroline, Tompkins Co., May 23, 1915, *Wiegand 4500* (MO, GH); Buffalo, *Clinton* (MO); Berlin, Rensselaer Co., Sept. 18, 1932, *House 20174* (GH); Black Rock Forest, Orange Co., July 23, 1936, *Raup 7697* (GH); Black Rock Forest, Aug. 1, 1936, *Raup 7794* (GH—some fruits approach *C. anceps*). **New Jersey:** Delaware Valley, Warren Co., Sept. 9, 1917, *Barton* (GH); Hackensack River, Closter, June, 1865, *Austin* (MO, GH); Collingswood, Camden Co., June 19, 1926, *Adams 298* (MO, GH). **Pennsylvania:** Philadel-

phia, Aug., 1832, *Moser* (COTYPE of *C. deflexa β Austini*—MO, NY); Phillipsburg, Center Co., Aug. 29, 1939, *Wahl 411* (GH); West Chester, *Darlington* (MO); Naomi Pines Lake, Pocono Plateau, July 29, 1904, *Harshberger* (some fruits close to *C. anceps*—NY, CM, MO). **Delaware:** Townsend, May 17, 1883, *Commons* (MO, NY). **Maryland:** Shad Point, Wicomico Co., Aug. 17, 1906, *Shreve & Jones 1181* (US); Garrett Co., Sept. 19, 1881, *Smith* (US, GH); Beltsville, Prince Georges Co., Sept. 3, 1916, *McAtee 2697* (US). **District of Columbia:** Potomac Flats, May 11, 1890, *Coville* (US). **Virginia:** Luray, Aug. 26, 1901, *Steele & Steele 45* (MO, US, NY, GH); Barcroft, May 13, 1928, *McAtee 3379* (US); Port Norfolk, May 24, 1912, *Robinson 323* (GH); Sebrell, Southampton Co., May 22, 1939, *Fernald & Long 9970* (GH); Burgess Station, Dinwiddie Co., May 19, 1939, *Fernald & Long 9969* (GH). **North Carolina:** Williamston, Martin Co., June 21, 1927, *Wiegand & Manning 1850* (GH); Biltmore, April, 1897, *Biltmore Herbarium 1725* (GH, US, NY). **South Carolina:** Georgetown Landing, Georgetown Co., April 10, 1932, *Weatherby & Griscom 16575* (US, GH). **Georgia:** Stone Mountain, May 24, 1897, *Eggert* (MO); Winterville, Clarke Co., May 8, 1941, *Duncan 29* (GA). **Florida:** "In paludibus, ad lac. Jamony," April, 1843, *Rugel* (MO, NY); Tallahassee, *Berg* (NY). **Ontario:** Niagara, July 8, 1901, *Macoun 44411* (GH). **Ohio:** Kimball, Erie Co., May 26, 1897, *Moseley* (MO, GH); Windham Twp., Portage Co., Aug. 31, 1924, *Webb 5522* (GH). **West Virginia:** Morgantown, Monongalia Co., May 20, 1945, *Bartholomew 520* (WVA, MO, US, GH); Harman, Randolph Co., Sept. 12, 1904, *Greenman 159* (GH). **Kentucky:** Croley, Aug. 28, 1923, *McFarland & Anderson 319* (MO, US); Murray, Calloway Co., July 22, 1937, *Smith & Hodgdon 4146* (GH). **Tennessee:** Nashville, April, 1880, *Gattinger 2464* (NY, US, MO, CM); Natchez Trace Parkway, Wayne Co., April 24, 1947, *McDougal 1261* (US); Tullahoma, Coffee Co., May 14, 1939, *Svenson 10117* (US, MO, GH); Pelham, Grundy Co., May 15, 1939, *Svenson 10151* (WIS). **Alabama:** Auburn, Lee Co., March 26, 1897, *Earle & Baker* (NY, MO, CM) and April 16, 1898 (US—mixed with *C. terrestris*); Talladega Co., July 17–19, 1900, *Pollard & Maxon 243* (US, NY). **Indiana:** Griffith, Lake Co., July 12, 1920, *Deam 31640* (GH); Mt. Vernon, Posey Co., June 15, 1935, *Hermann 6648* (GH). **Wisconsin:** Devils Lake, Sauk Co., Aug. 5, 1897, *Umbach* (WIS, GH, CM); Morrison Creek Falls, Jackson Co., Aug. 10, 1938, *Catenhusen* (WIS). **Illinois:** Skokie Marsh, Glencoe, June 12, 1911, *Sherff* (MO, CM); Athens, Menard Co., 1861, *Hall* (US, MO, GH); 5 miles west of Kankakee, June 1, 1941, *Schneider 1893* (WIS—fruit close to *C. anceps*). **Mississippi:** Biloxi, March 10, 1898, *Tracy 4976* (NY, US, MO, GH, CM). **Iowa:** Ruthven, Palo Alto Co., May 19, 1937, *Hayden 5084* (GH); Moscow, Muscatine Co., June 28, 1917, *Shimek* (MO). **Missouri:** St. Louis, May, 1842, *Geyer* (MO, NY); Eagle Rock, Barry Co., Sept. 29, 1896, *Bush 57* (US, MO, NY); Long Run, Ozark Co., July 11, 1937, *Steyermark 23244* (MO, CM). **Arkansas:** Mt. Magazine, Havana, June 6, 1931, *Haas 2006* (US); between West Fork and Devils Den State Park, Washington Co., April 18, 1939, *Fassett 20931* (WIS, MO, GH); Magnet Cove, Hot Springs County, April 30, 1939, *Demaree 19036* (MO, CM). **Louisiana:** Natchitoches, April 27, 1915, *Palmer 7403* (MO, US); St. Martinsville, March, 1888, *Langlois* (MO). **Kansas:** Riley Co., 1895, *Hitchcock 975* (MO, US, GH, NY). **Oklahoma:** Cherokee Nation, Aug. 20, 1895, *Blankinship* (MO, US, GH); Verdigris, Oct. 5, 1894, *Bush 149* (MO, GH). **Texas:** Houston, April 16, 1872, *Hall 543* (CM, US, MO, GH, NY); Blanco River, *Wright* (NY); Little Aguja Canyon, Davis Mountains, Jeff Davis Co., June 12, 1931, *Moore & Steyermark 3080* (US, MO, NY, GH, CM). **Montana:** Helena, Aug., 1892, *Starz* (MO). **Idaho:** Juliaetta,

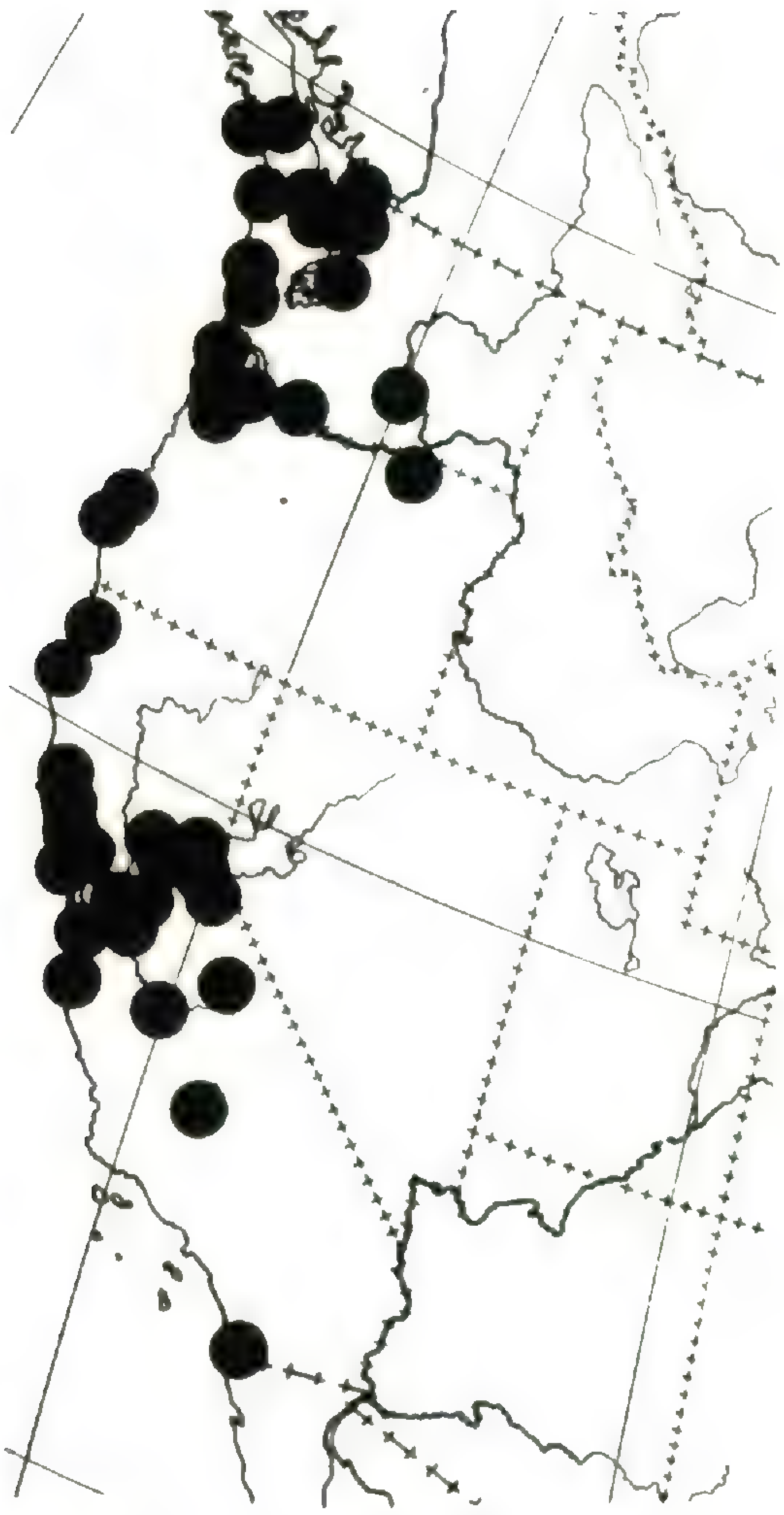


13. *C. heterophylla* var. *heterophylla.*

Oct. 7, 1898, *Henderson 4604* (GH). **Washington:** Bingen, Klickitat Co., July 13, 1920, *Suksdorf 10553* (MO, GH, NY, UC, US). **Oregon:** Lakeview, Lake Co., May 29, 1940, *Hitchcock 6735* (MO); W. Salem, Polk Co., April 13, 1918, *Nelson 2040* (GH); Steens Mts., Harney Co., July 31, 1946, *Maguire & Holmgren 26753* (NY). **California:** Searsville, *Bolander* (GH—mixed with *C. marginata*, *C. verna*, and an aquatic *Ranunculus*—probably COTYPE of *C. stenocarpa* Heglem.); Glen Alpine Lake, Eldorado Co., Sept. 4, 1935, *Abrams 13701* (GH); Mather, Tuolumne Co., June 1, 1931, *Keck 1171* (GH); Ione, Amador Co., March 19, 1921, *Eastwood 10083* (GH); Knight's Ferry, Stanislaus Co., April, 1930, *Mason 5549* (UC); San Bernardino Mountains, June 28, 1894, *Parish 3395* (MO, US). **Arizona:** 37 miles from Young on road to Payson, Gila Co., May 24, 1937, *Peebles & Smith 13296* (US). **Mexico:** Majalca, Chihuahua, June 24, 1936, *LeSueur 768* (CM, GH); Sierra Madre, Chihuahua, Oct. 6, 1887, *Pringle 1523* (NY); Morales, San Luis Potosí, 1879, *Schaffner 123* (NY); San Luis Potosí, March, 1878, *Parry* (MO); Zimatlán, Oaxaca Mts., Dec. 8 & 9, 1905, *Conzatti 1311* (US); Sierra de Pachuca, Hidalgo, July 20 & 24, 1905, *Rose & Painter 8865* (US). **Guatemala:** Dept. Huehuetenango, between Tojquiá and Caxín bluff, Sierra de los Cuchumatanes, alt. 3700 m., Aug. 6, 1942, *Steyermark 50222* (US, CM). **Hispaniola:** Santo Domingo, Cordillera Central, prov. de la Vega, Valle Nuevo, Aug. 17, 1929, *Ekman 13821* (US); prov. de la Vega, Constanza, Los Montazos, Oct. 21, 1929, *Ekman 13885* (US).

Uruguay: Blanquillo, Dept. Duranzo, Sept., 1947, *Herter 1966* (MO). **Argentina**: Partido de Tornquist, Sierra de la Ventana, Parque Provincial, Provincia de Buenos Aires, Oct. 6, 1939, *Cabrera 5305* (LP).

C. heterophylla var. **Bolanderi** (Hegelm.) n. comb. *C. Bolanderi* Hegelm. Verhandl. Bot. Ver. Brandenburg 10: 116. 1869; Howell, Fl. N. W. Am. 219. 1898; Peck, Man. Higher Pl. Ore. 466. 1941.—Southern Vancouver Island, Washington, Oregon and California, in many places grading into var. *heterophylla*.—**British Columbia**: Cowichan Lake, Vancouver Island, June 14, 1907, *Rosendahl 1761* (US, NY, MO, GH); District of Renfrew, Aug. 7, 1902, *Rosendahl 885* (NY, MO); Koskilah, July 20, 1908, *Macoun 88228* (NY, US, GH); Somenos, June 11, 1887, *Macoun* (NY, US, UC); Ucleulet, July 1, 1909, *Macoun 88557* (NY); Alberni, July, 1916, *Carter 300* (US); Shawnigan Lake, Aug. 5, 1919, *Carter* (GH); Vancouver Island, June 11, 1887, *Macoun 43* (GH). **Washington**: Olympic Mts., Clallam Co., Aug., 1900, *Elmer 2779* (NY, US, MO); Hoquiam, Chehalis Co., May 10 or 11, 1897, *Lamb 1012* (NY, MO, CM); Aloha, Grays Harbor Co., July 9, 1933, *Thompson 9369* (NY); Montesano, May 20, 1917, *Grant* (NY, US); East Sound, July 20, 1905, *Euberg* (NY); Granville, July 17, 1902, *Conard 340* (US); Mt. Adams, August, October, 1881, *Suksdorf* (US, UC, CM, MO); Hoh River bottoms, Jefferson Co., April 25, 1924, *Otis 1408* (US); Seattle, April 28, 1889, *Piper 696* (US); Northwood Swamp, Whatcom Co., June 26, 1937, *Muenscher 8222* (UC) and Lummi Slough, *Muenscher 8221* (GH); Mount Baker National Forest, Whatcom Co., June 14, 1939, *Muenscher 9949* (WIS); Belfast, Friday Creek, Skagit Co., June 12, 1932, *Mason* (UC, GH); Cascade Mts., Sept., 1882, *Tweedy* (MO); Seattle, April 15, 1910, *Zeller* (MO); Seattle, April 23, 1889, *Smith* (MO); Yakima Terr., 1882, *Brandegee 15176* (MO). **Oregon**: Salem, 1871, *Hall 461* (MO, CM, GH, US); Salem, May 3, 1918, *Nelson 2093* (GH); Cape Blanco, June 25, 1919, *Peck 8537* (NY, MO, GH); Gale's Peak, Washington Co., Nov. 16, 1893, *Lloyd* (NY); Tillamook Co., June 25, 1894, *Lloyd* (NY); Sparta, Union Co., Oct. 15, 1897, *Sheldon 9121* (US); Arch Cape, Clatsop Co., July 11–12, 1922, *Abrams 8845* (MO); Bastendorf's Beach, Coos Co., June 26, 1926, *Scullen* (UC). **California**: Ione, Amador Co., 1889, *Greene* (US, CM, GH); Amador Co., July, 1892, *Hansen 486* (MO); Chico, Butte Co., May 4, 1929, *Kennedy* (UC); Wright's Lake, El Dorado Co., July 22, 1934, *Copeland* (UC); Layne's Ranch, El Dorado Co., April 30, 1909, *Brandegee* (UC); Eureka, Humboldt Co., May 23, 1909, *Tracy 2974* (UC); Mad River Valley opposite Blue Lake, June 13, 1909, *Tracy 2994* (UC); Ryan's Slough, Humboldt Bay, April 13, 1913, *Tracy 4038* (UC, NY, US); between High Prairie and Redwood Creek, Humboldt Co., May 28, 1918, *Tracy 4950* (UC); Lone Pine, Inyo Co., Aug. 31, 1942, *Alexander & Kellogg 3421* (UC); Kernville, Kern Co., June 23, 1891, *Coville & Funston 1043* (US); Bogg's Lake, Mt. Hannah, Lake Co., May 22, 1929, *Blankinship* (MO); Madera, Madera Co., March 24, 1929, *Mason 5111* (UC, GH); Olema, Marin Co., April 26, 1929, *Mason 5224* (UC); Ukiah, Mendocino Co., *Bolander* (MO); Carmel Hill, Monterey Co., April 4, 1916, *Abrams 5599* (NY); Mount Saint Helena, Napa Co., June 21, 1932, *Fenley* (UC); St. Helena, Napa Co., April 19, 1903, *Baker 1998* (US, MO, GH) and *2772* (NY, US, MO, GH); Auburn, Placer Co., April 11, 1865, *Bolander 4528* (US, MO—ISOTYPES of *C. Bolanderi*); near San Francisco, *Wilkes 1380* (US); Julian, San Diego Co., June, 1882, *Parish 1404* (NY, GH, CM); Clements, San Joaquin Co., April 7, 1929, *Mason 5202* (UC); Mount Day Ridge, Mount Hamilton Range, Santa Clara Co., May 21, 1936, *Sharsmith 3677* (UC); Kenwood, Sonoma Co., April, 1893, *Bioletti* (UC); Oakdale, Stanislaus Co., April 5, 1929, *Mason 5170* (UC); Tuolumne R., 1866, *Bolander 5090* (US, UC, MO);



13a (left). *C. heterophylla* var. *Bolanderi*. 15 (right). *C. hamulata* in the New World.

Searsville, *Bolander* (MO—mixed with *C. verna*, *C. marginata*, and an aquatic *Ranunculus*—probably COTYPE of *C. stenocarpa*); Glacier Point, Yosemite National Park, Sept. 3, 1932, *Wiggins 5903* (UC).

Pursh described 3 species, with no mention of fruit. His *C. heterophylla*, with spatulate-obovate floating leaves and linear submersed leaves could have been the species here under consideration or it could have been *C. verna*. *C. linearis*, with leaves all linear but the upper ones somewhat spatulate could also have been either the *C. heterophylla* or the *C. verna* of the present treatment, but scarcely *C. autumnalis* as Pursh suggested. *C. brevifolia* could have been a terrestrial form of *C. heterophylla*, or possibly the *C. terrestris* of the present treatment. I am indebted to Dr. F. W. Pennell of the Academy of Sciences of Philadelphia and to Sir Edward Salisbury of the Royal Botanic

Gardens at Kew for the information that Pursh's material representing these three names is not to be found at either institution.

The first definite application of the name *C. heterophylla* appears to have been made by Darby in 1841.[1] While he did not describe the fruit, his description of foliage applies, in his region, only to this species. He described, also, the floral bracts ("*Perianth* persistent, lanceolate, white") found only in *C. heterophylla* in the southern states. Hegelmaier, in 1864, clearly described *C. Asagraei*, with only a rather ambiguous reference to *C. heterophylla* and *C. linearis* as related species. Three years later Hegelmaier definitely adopted the name *C. heterophylla* in the sense used by Darby as well as by most authors since that time, reducing *C. Asagraei* to its synonymy. In the same year, Engelmann, with whom Hegelmaier had been exchanging both material and comments, also took up *C. heterophylla* in its modern application, with the citation of *C. Asagraei* as a synonym and *C. brevifolia* and *C. linearis* as phases of it.

C. heterophylla var. *Bolanderi* seems indistinguishable from the broad-ranging phase of the species, except in size of fruits (compare Figs. 13a to 13x with Figs. 13Aa to 13Aq on the same page). These two phases definitely intergrade, as is shown in Graph I. Here are plotted the width and height of fruits of 50 individuals picked at random from eastern collections (var. *heterophylla*) and 50 individuals of var. *Bolanderi*. Fruits of var. *heterophylla* range from 0.6–1.0 mm. in height, with a great majority having a height of 0.7 mm. In var. *Bolanderi* they range from 0.7–1.2 mm. in height, a majority having a height of 1.0 mm. While the recognition of varieties on measurements involving tenths of millimeters may seem like hair-splitting, it must be remembered that we are dealing with very small objects: the mean length of the fruit of *Bolanderi* is half again as great as that of *heterophylla*, and the volume of the fruit is more than three times as great.

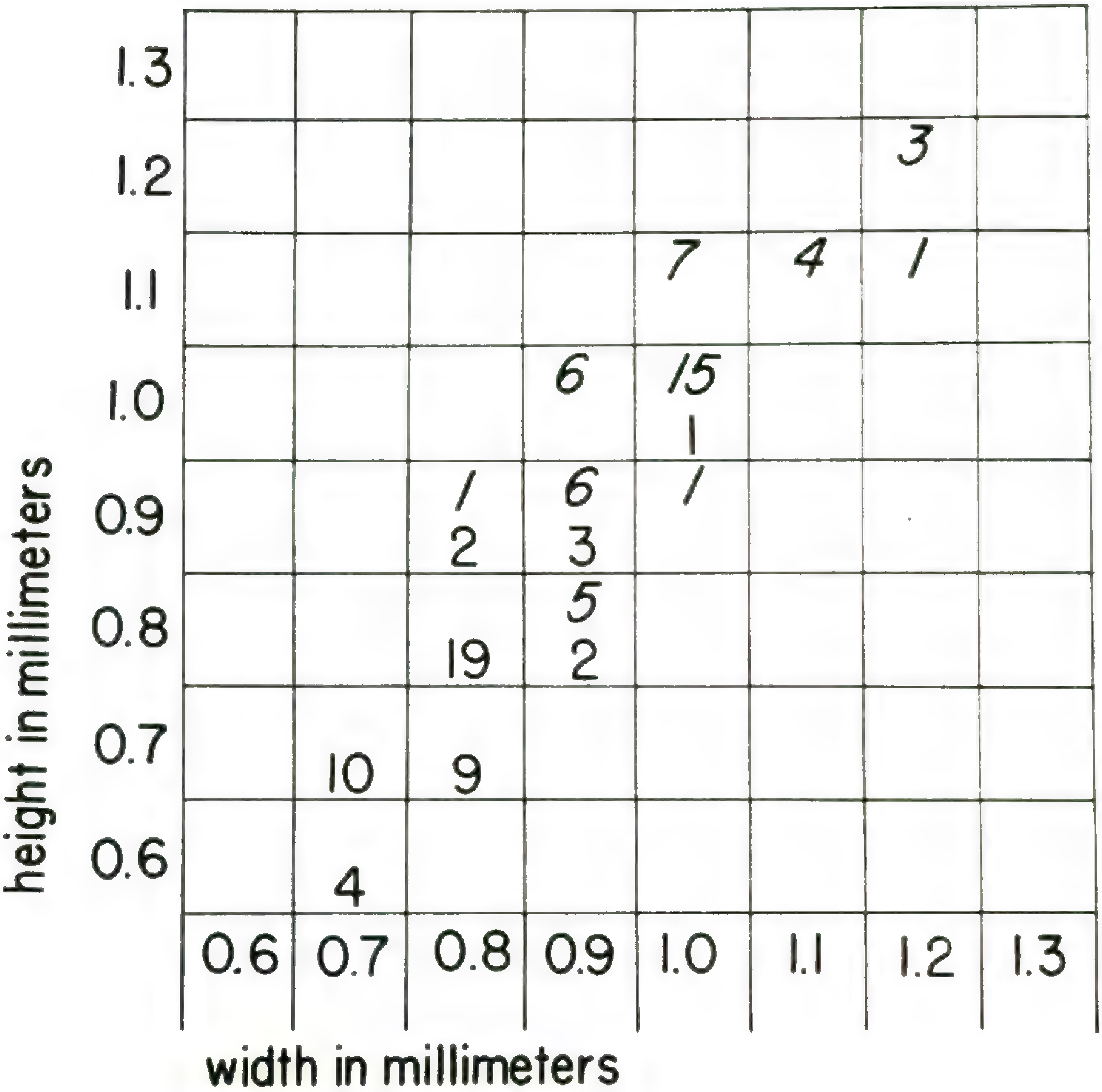
The original description of *C. Bolanderi* really has very little of diagnostic value, but the two isotypes cited above are clearly the large-fruited plant of California.

The original description of *C. Tuerckheimii* is long and detailed, but most of the details refer to the Section *Callitriche* as distinguished from Section *Microcallitriche*. There is nothing in

[1] I am indebted to Dr. Wilbur H. Duncan for a copy of the description from th[e] rare volume.

GRAPH 1.

Size classes of fruits of *C. heterophylla* var. *heterophylla* (erect numerals) and var. *Bolanderi* (*slanted numerals*).



the description that does not apply perfectly to *C. heterophylla;* the type material has not been seen but the two collections cited, from the same region, seem to be *C. heterophylla.*

The width and height of the fruit are often equal, and do not differ from one another by more than 0.1 mm. A pair of fruits like those illustrated as 13Aa and 13Ag may look quite different but their relationship to the ranges of variability may be seen by study of Graph I. Wide-fruited individuals like Fig. 13w have been confused with *C. terrestris,* even by Hegelmaier, who cited such an individual with his description of *C. deflexa β Austini.* Conversely, narrow fruits like Fig. 13a and 13Aa are often identified as *C. verna.*

Persistence of the styles, often used to distinguish *C. verna* from *C. heterophylla,* appears to be of no significance.

While the carpels are usually quite wingless, there is sometimes a minute wing at the summit of the fruit, 5–10 micra wide (Figs. 13i, 13o, 13v, 13z). This can ordinarily be demonstrated only after a mericarp has been boiled in KOH, the pericarp stripped from the seed and examined with a compound microscope. The figures were drawn from such preparations.

The true wing is clearly differentiated from the reticulate face of the mericarp. What may be called a false wing is of more frequent occurrence. This seems to be formed when the seed fails to fill the mericarp completely, and the unexpanded marginal portion of the pericarp appears thin and wing-like, but more or less reticulate like the rest of the pericarp. Such a fruit is shown in Figs. 4 & 5 of Plate 1167. Dr. Engelmann observed this condition and was confused by it (as was the present writer), noting on a sheet from South Carolina, "These southern specimens are to me doubtful, and apparently intermediate or transitionform—but I refer them now (doubtfully) to *verna.* G. E. 1864."

From Newfoundland to Cape Cod, there are occasional individuals intermediate between *C. heterophylla* and *C. anceps,* and between *C. heterophylla* and *C. verna.* These seem to be most common in the White Mountain region of New Hampshire.

The two sheets of *C. heterophylla* var. *heterophylla* cited from South America are both from the region about the mouth of Rio de la Plata, and both appear to be quite characteristic of this species. Perhaps there has been a mixing of labels, never-

theless these represent two separate collections in the same general region, but in different places at different times by different collectors.

(*to be continued*)

A Catalogue of Freshwater Algae of the Maritime Provinces.—Since publication of the article *A List of Freshwater Algae from New Brunswick*, Rhodora **50**: 67–71 (1948), there has appeared a paper on *Fresh-Water Algae of the Maritime Provinces* by Elwyn O. Hughes[1]. This article is one of an excellent series dealing with the local flora that through recent years have been put out in the Proceedings of the Nova Scotian Institute of Science. This article brings to date the knowledge concerning the Freshwater Algae of the Maritime Provinces, exclusive of the *Bacillariales* and *Charales*, and renders to the students of the local flora a very handy reference source.

Yet, it should be pointed out that a noreworthy part of the species listed are a compilation from the literature, and here of course the author, in working with strange groups and unfamiliar synonymy, would lend himself to repetition as, for example: *Chroococcus turgidus* (Kuetz.) Naeg. and *Gleocapsa turgida* (Kuetz.) Hollerb.; *Coelosphaerium naegelianum* Unger and *Gomphosphaeria naegelianum* (Ung.) Lemm. In the Catalogue several noteworthy species, given in *A List of Freshwater Algae from New Brunswick*, are omitted. These are *Botrydium granulatum* (L.) Grev., *Chlorotylium cataractarum* Kütz., *Cladophora crispata* (Roth) Kütz., and *Plectonema Nostocorum* Gom. The last is definitely an omission on the part of the printer. An error that could be blamed on the printer or editor is the use several times of the figure "(23)" where it should refer to cited literature on the Desmids, but leading one to *A Taxonomic Study of the Genus Vaucheria Collected in California*.

Outside of these small points, the work is to be commended. And it is to be regretted that the author did not publish the more than five hundred drawings made in the course of identification, as the four plates of illustrations included are very good, and as the many fine published figures referred to are in works which, in many cases, are unobtainable. Where can one buy such things as Krieger's *Die Desmidiaceen Europas* or West, West and Carter's *Monograph of the British Desmidiaceae?* It is doubtful that one of these two works could be found in any one of the Libraries of the Maritime Provinces. And it is hoped that the chief work cited for the *Zygnemataceae* will soon come off the press and become available to the general botanical public.—Herbert Habeeb, Grand Falls, New Brunswick.

A Flora for North Dakota.[2]—In several respects this is not a conventional state flora and it goes beyond the minimal requirements of a handbook. For example, such topics as the physiography of North Dakota, distribution of species within the state, plant characters, how to use the keys, etc., are treated in the first twenty-eight pages of the book. Important terms applying to plant characteristics are illustrated. Similarly, illustrations of many diagnostic features of plant groups appear along the margin of the general key to families. In all, one colored plate, twenty-eight photographs, seventy draw-

[1] Elwyn O. Hughes. *Fresh-Water Algae of the Maritime Provinces.* Proc. N. S. Inst. Sci. **22**, pt. 2: 1–63 (1949).

[2] Handbook of North Dakota Plants by Orin Alva Stevens. North Dakota Agricultural College. Fargo, North Dakota. 1–324 (illustrated), 1950. $4.50.

ings and about two hundred sketches are included. With the free use of such devices, Professor Stevens has produced a unique book for the learner and amateur as well as the professional botanist. Technical terms have been kept to a minimum but are used where they are needed for clarity.

The descriptions of individual species are brief, with stress laid upon the outstanding characteristics of each. The description is often followed by a statement of the principal habitat. For every species there is a stated range in North Dakota often including notes on specific collection sites. Occasionally historical notes or other pertinent information are included. The notes so frequently appended to the species descriptions show that Professor Stevens knows the plants about which he writes and has made an effort to provide the reader with first-hand information wherever possible.

The nomenclature is conservative yet up to date, including in most instances the results of the most recent investigations. The flora dealt with is less complex than that of many areas of the United States where there is a more varied terrain. This is strikingly shown by the fact that only 1143 species are included. Anyone interested in the flora of the northern great plains region will find "Handbook of North Dakota Plants" a very useful source of information. Highlighting as it does the distributional patterns within the state, it should prove to be a substantial stimulus toward study of plants of the area by resident botanists.—R. C. Rollins.

Alfred Shepard Goodale.—Prof. Alfred Shepard Goodale, late professor of botany at Amherst College, died Feb. 16, 1951, after a long illness. He was a graduate of Amherst, being a member of the class of 1898.

He and his students spent much time on the local flora, and prepared a checklist of the three Connecticut River Counties in Massachusetts. When several towns east of Amherst were to be stripped for the Quabbin Reservoir, he and his students made a detailed study of their flora, collecting a large number of representative specimens. Encouraged by President Arthur Stanley Pease, the college herbarium was increased from 15,000 specimens to 83,000 under his direction.

Prof. Goodale was an unassuming man, but a diligent and conscientious student and worker.—C. H. Knowlton.

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CALLITRICHE IN THE NEW WORLD

NORMAN C. FASSETT

(*continued from p. 182*)

14. **C. quindiensis**, n. sp., fructibus 1.4–1.5 mm. latis, 1.2–1.4 longis, nitidis, non alatis, sessilibus (Figs. 14a–14c).—**Colombia**: pool on moor, alt., 4100–4300 m., Paramo del Quindío, Dept. Caldas, Aug. 15–20, 1922, *Pennell & Hazen 9850* (TYPE in GH; ISOTYPES in US, NY).

As is true for any species of the Sect. Callitriche known from a single collection, we can only describe the habit and vegetative characters of that individual, and speculate on possible variation by analogy with other species.

The type collection is from a pool on the high paramo. Several large clumps of intertwined stems on each sheet suggest that it made a dense growth in the water. All the lower leaves are gone, only the spatulate or oblanceolate-obovate leaves 1–2.5 mm. wide remaining on the uppermost few centimeters of stem. The stems appear coarser than is common in the genus. Both stems and leaves have blackened extensively; this may be due to a fleshy nature, or it may only reflect the difficulties of drying a wet mass of aquatic vegetation in the mountains of Colombia.

15. **C. hamulata** Kütz. apud Reichenb. Icon. Fl. Germ. 5: 1, pl. CXXX, figs. a–c. 1841; Hegelm. Monogr. Callit. 56. 1864; Hegelm. Verhandl. Bot. Ver. Brandenburg 9: 29. 1867; Samuelsson, Fest. Carl Schröter 627. 1925. *C. autumnalis* Kütz. in Reichenb. Pl. Crit. 9: pl. DCCCXC. 1831, not L. *C. intermedia* Hoffm. according to Pearsall, Rep. Bot. Soc. & Exch. Club Br. Isles 10: 865. 1935. (*C. intermedia* Hoffm. Deutsch. Fl. 2. 1791 is not identifiable, only the foliage being described. Hoffmann refers to Schkuhr, Bot. Handb. t. I, fig. e. 1791, which, again, might be any of several species).—Fruit 0.9–1.2 mm. wide and about as high, with sides nearly parallel and faces rather flat; margins of carpels with a narrow but well-differentiated and even

wing (Fig. 15b); commissural groove very wide, often flat across its base (Fig. 15a); style long and sharply reflexed from well below the summit of the carpel (Fig. 15b), often caducous but usually leaving a visible stub; leaves variable but predominantly of the linear submersed type; linear 1-nerved leaves deeply bidentate at tip, with the enlarged gland-like tip of the nerve slightly excurrent (Fig. 15d).—Europe; but one clearly identifiable collection seen from the New World, in **Greenland:** Vest-Grønland, Nordkysten af Sarqardleg, 68° 42′ N. 52° 30′ W., Aug. 13, 1932, *Porsild* (MO, US, GH).

The variations in leaf type and habit, closely paralleling those of *C. heterophylla*, are described by Glück, l. c. This species is generally more slender and delicate than *C. heterophylla*, more closely resembling *C. anceps* in this respect. The single collection cited above has only linear 1-nerved leaves and looks like Fig. 6 on Plate 1168. There are other similar plants from Greenland, with fruits less well-developed; they may be this species or may be *C. anceps*.

Plate 1173

(Numbers same as in keys and descriptions)

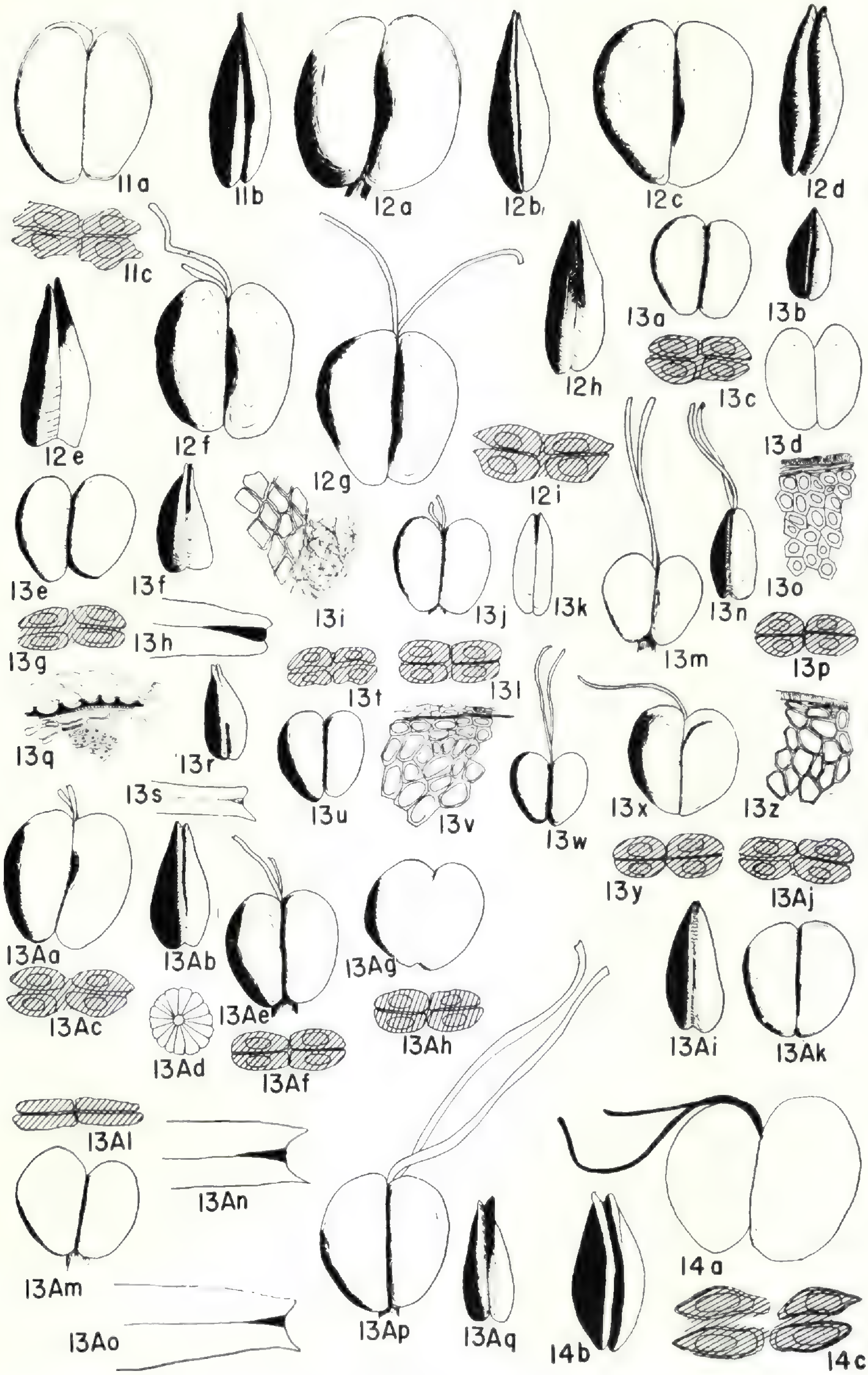
11. *C. albomarginata*. 11a. Face of fruit, × 30. Chile, *Reich* in 1899 (GH). 11b. Edge view of fruit, × 30. Same collection. 11c. Cross-section of fruit, × 30. Same collection.

12. *C. heteropoda*. 12a. Face of fruit, × 30. Bolivia, *Kuntze* (NY). 12b. Edge view of fruit, × 30. Same collection. 12c. Face of fruit, × 30. Bolivia, *Buchtien 8436* (NY). 12d. Edge view of fruit, × 30. Same collection. 12e. Edge view of fruit, × 30. Same collection. 12f. Face of fruit, × 30. Same collection (US). 12g. Face of fruit, × 30. Bolivia, *Bang 1887* (US). 12h. Edge view of fruit, × 30. Same collection. 12i. Cross-section of fruit, × 30. Same collection.

13. *C. heterophylla* var. *heterophylla*. 13a. Face of fruit, × 30. New York, *Muenscher & Bechtel 257* (US). 13b. Edge view of fruit, × 30. Same collection. 13c. Cross-section of fruit, × 30. Same collection. 13d. Face of fruit, × 30. Maryland, *McAtee 2697* (US). 13e. Face of fruit, × 30. Virginia, *McAtee 3379* (US). 13f. Edge view of fruit, × 30. Same collection. 13g. Cross-section of fruit, × 30. Same collection. 13h. Leaf tip, × 30. Same collection. 13i. Portion of wing and face of fruit, × 187.5. Virginia, *Robinson 323* (GH). 13j. Face of fruit, × 30. Tennessee, *McDougal 1261* (US). 13k. Edge view of fruit, × 30. Same collection. 13l. Cross-section of fruit, × 30. Same collection. 13m. Face of fruit, × 30. Tennessee, *Svenson 10117* (US). 13n. Edge view of fruit, × 30. Same collection. 13o. Portion of wing and face of fruit, × 187.5. Same collection. 13p. Cross-section of fruit, × 30. Same collection. 13q. Section of pericarp, seed-coat, endosperm and embryo, × 187.5. From section of fresh material from Baxter's Hollow, Baraboo, Wisconsin. 13r. Edge view of fruit, × 30. Maine, *Harvey 345–1* (US). 13s. Leaf tip, × 30. Same collection. 13t. Cross-section of fruit, × 30. Same collection. 13u. Face of fruit, × 30. Same collection. 13v. Portion of wing and face of fruit, × 187.5. Same collection. 13w. Face of fruit, × 30. Louisiana, *Palmer 7403* (US). 13x. Face of fruit, × 30. Arkansas, *Haas 2006* (US). 13y. Cross-section of fruit, × 30. Same collection. 13z. Portion of wing and face of fruit, × 187.5. Same collection.

13A. *C. heterophylla* var. *Bolanderi*. 13Aa. Face of fruit, × 30. Washington, *Piper 686* (US). 13Ab. Edge view of fruit, × 30. Same collection. 13Ac. Cross-section of fruit, × 30. Same collection. 13Ad. Peltate scale from leaf, × 30. Oregon, *Nelson 2095* (GH). 13Ae. Face of fruit, × 30. Oregon, *Hall 461* (MO). 13Af. Cross-section of fruit, × 30. Oregon, *Nelson 2095* (GH). 13Ag. Face of fruit, × 30. California, *Bioletti* (NY). 13Ah. Cross-section of fruit, × 30. Same collection. 13Ai. Edge view of fruit, × 30. California, *Newbery* (US). 13Aj. Cross-section of fruit, × 30. Same collection. 13Ak. Face of fruit, × 30. Same collection. 13Al. Cross-section of fruit, × 30. California, *Bolander 4528* (US). 13Am. Face of fruit, × 30. Same collection. 13An. Leaf tip, × 30. Same collection. 13Ao. Leaf tip, × 30. Same collection. 13Ap. Face of fruit, × 30. California, *Tracy 4038* (NY). 13Aq. Edge view of fruit, × 30. Same collection.

14. *C. quindiensis*. 14a. Face of fruit, × 30. Colombia, *Pennell & Hazen 9850* (US). 14b. Edge view of fruit, × 30. Same collection. 14c. Cross-section of fruit, × 30. Same collection.



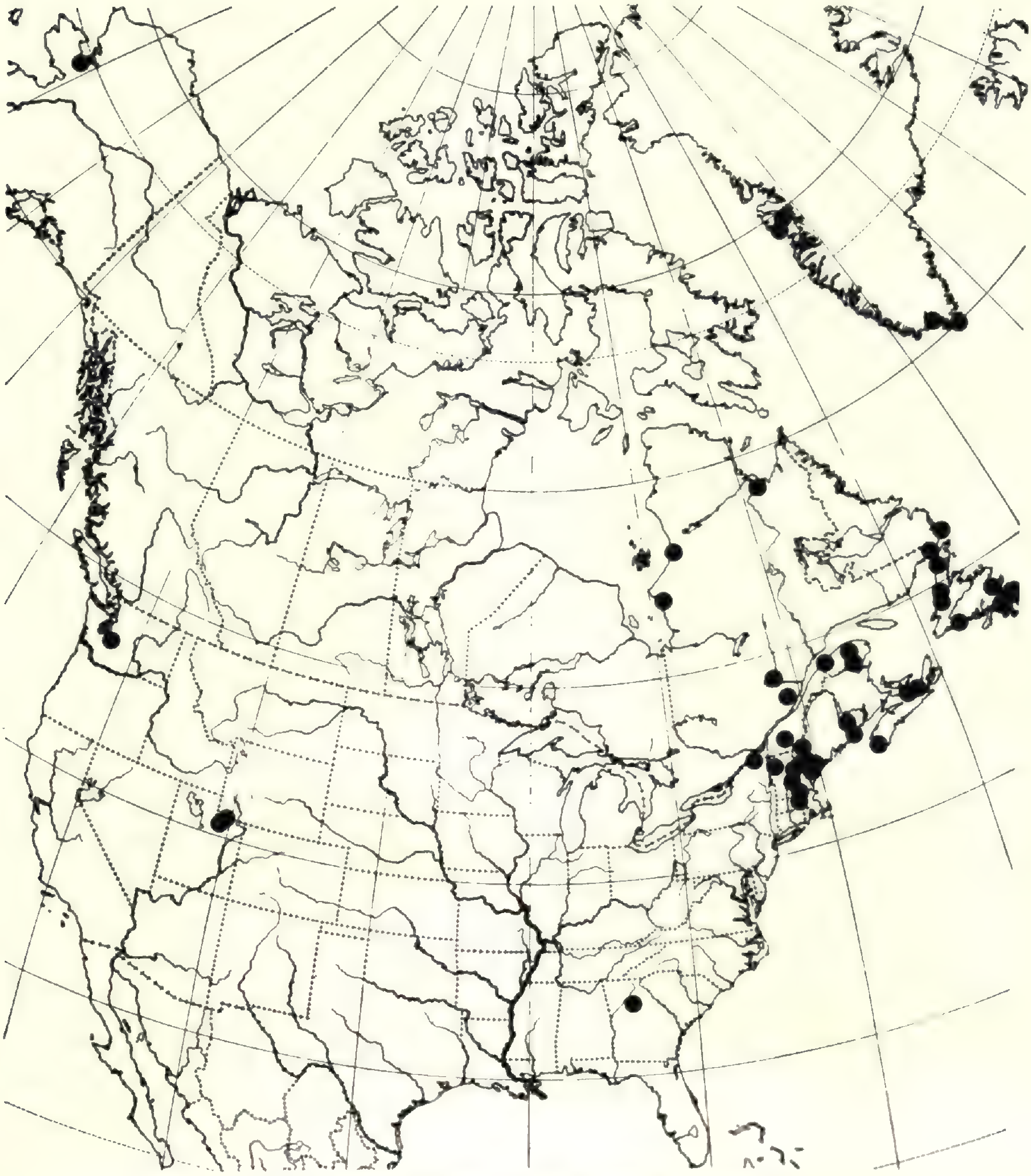
Callitriche. 11, C. albomarginata. 12, C. heteropoda. 13, C. heterophylla. 14, C. quindiensis.

16. **C. anceps** Fernald, Rhodora 10: 51. 1908; Fernald in Gray's Manual, ed. 8: 974. 1950.—Fruits 0.7–1.0 mm. wide, 0.6–1.1 mm. high, the sides nearly straight and parallel (Figs. 16b, 16d, 16h) or somewhat rounded (Figs. 16f, 16i); mericarps with rounded margins (Figs. 16a, 16c, 16g, 16j), wingless or very narrowly winged (Fig. 16i); edges of carpels usually in contact (Fig. 16a), rarely with a shallow commissural groove (Fig. 16j); styles erect or ascending, caducous or persistent; leaves sometimes all linear and 1-nerved (Plate 1169, Figs. 3, 5, 6, 7, 9) or all broad and rounded (Plate 1169, Fig. 4), or with both types on the same plant, or tongue-like on semiterrestrial individuals (Plate 1169, Fig. 1); linear 1-nerved leaves bidentate at tip, with the enlarged gland-like end of the vein slightly exserted (Fig. 16e).—Western Greenland to northern New England, rarely to Georgia in the mountains, and from Alaska to Washington and the mountains of Utah.—**Greenland:** S. Disko, Godhavn, 69° 15′ Lat. bor., Aug. 31, 1923, *Porsild* (gh, ny); Kangikitsum Quingua, 60° 18′ N., July 24, 1925, *Porsild & Porsild* (mo); Frederiksdal, 60° 0′ N., July 25, 1925, *Porsild & Porsild* (gh, us); S. Disko, near Arktisk Station, 69° 15′ N., Aug. 6, 1929, *Porsild* (gh, cm, us, mo); east coast of Disko Island, Mudderbugtsdalen, Aug. 4–5, 1937, *Porsild 391* (gh). **Labrador:** Battle Harbor, Aug. 26, 1928, *Bishop 409* (gh); Battle Harbor, Aug. 9, 1911, *Williamson 673* (ny); Blanc Sablon River, Straits of Belle Isle, Aug. 2, 1910, *Fernald & Wiegand 3648* (gh) and *3649* (gh, ny); Blanc Sablon River, Straits of Belle Isle, Sept. 3, 1925, *Fernald, Wiegand & Long 28640* (gh) and *28641* (gh), Sept. 4, 1925, *28642* (gh). **Newfoundland:** Green's Harbor, *Waghorne* (gh); Whitbourne, Aug. 15, 1894, *Robinson & Schrenk 215* (gh, cm, ny, us, mo); Torbay, Aug. 21–26, 1901, *Howe & Lang 1398* (gh, ny—some fruits approaching *C. heterophylla* or *C. verna*); Blomidon Mountains, Bay of Islands, Aug. 22, 1910, *Fernald & Wiegand 3657* (gh); Harbor Grace, July 30, 1911, *Williamson 499* (ny); between Quiddy Viddy Lake and Middle Cove, Aug. 1, 1911, *Fernald & Wiegand 5812* (gh); Killigrew's, Conception Bay, Avalon Peninsula, Aug. 3, 1911, *Fernald & Wiegand 5818* (gh); Brigus Junction, Collier's River, Avalon Peninsula, Aug. 5, 1911, *Fernald & Wiegand 5813* (gh—young fruits approach *C. heterophylla & C. verna*); Whitbourne, Rocky River, Avalon Peninsula, Aug. 8, 1911, *Fernald & Wiegand 5815* (gh); Rushy Pond, Exploits River, Aug. 11, 1911, *Fernald & Wiegand 5816* (gh, us); Grand Falls, Exploits River, Aug. 15, 1911, *Fernald & Wiegand 5817* (gh, cm, ny, mo, uc—some with a few fruits approaching *C. heterophylla*); Clarenville, Random Sound, Trinity Bay, Aug. 19, 1911, *Fernald & Wiegand 5814* (gh); Bard Harbor, St. John Bay, Aug. 26, 1925, *Gilbert & Hotchkiss 28638* (gh); Burgeo, Sept. 9, 1926, *Fernald, Long & Fogg 314* (gh); Burgeo, Sept. 10, 1926, *Fernald, Long & Fogg 315* (gh) and *316* (gh); Deer Brook, Bonne Bay, Aug. 26, 1929, *Fernald, Long & Fogg 1850* (gh); Cappa Hayden, Sept., 1934, *Ayre* (gh—some fruits approach *C. heterophylla*). **St.-Pierre et Miquelon:** Yoiles Blanches (Langlade), Sept. 5, 1935, *LeHors* (gh). **Quebec:** River Etamamiou, Charney, Labrador Peninsula, Saguenay Co., Aug. 28, 1915, *St. John 90578* (gh); Fort Chimo area, 58° 07′ N, 68° 23′ W, Aug. 17, 1948, *Calder 2671* (wis); Richmond Gulf, east coast of Hudson Bay, 56° 10′ N, 78° 50′ W, Aug. 19, 1944, *Dutilly & Lepage 13248* (wis); Fort Georges, east coast of Hudson Bay, Aug. 25, 1944, *Dutilly & Lepage 13351* (wis); Lac Turgeon, Parc des Laurentides, Charlevoix Co., Aug. 22, 1940, *Desmarais 495* (wis); Kondiaronk, près des sources de la riviere Ouiatchouan, Lac Saint-Jean, Aug. 21, 1922, *Victorin 16264* (gh); Lac des Américains, Table-top Mountain, Gaspé Co., Aug. 1, 1906, *Fernald & Collins 234* (gh—Type, us, ny); Table-topped Mountain, Gaspé Co., Aug. 4,

1906, *Fernald & Collins 637* (GH) and Aug. 8, 1906, *638* (GH); Tabletop Mts., Aug. 11, 1923, *Fernald, Dodge & Smith 25878* (GH, US, NY, CM) and *25879* (NY); Mt. Tabletop, Aug. 6–9, 1934, *Louis-Marie et al. 34358* (GH); Lac Sainte-Anne, Gaspé Co., July 28, 1930, *Victorin, Rolland & Jacques 33514* (GH); Rivière Petite Cascapedia, Aug. 13, 1930, *Victorin, Rolland & Jacques 33330* (GH); Rivière Cap Chat, Matane Co., Aug. 27, 1923, *Fernald & Smith 25877* (GH); between Mts. Mattaouisse, Fortin and Logan, Matane Co., Aug. 21, 1923, *Fernald & Smith 25879* (GH); Pease Basin between Mts. Logan and Pembroke, Matane Co., Aug. 24, 1923, *Fernald & Smith 25880* (GH); Tadousac Lake, Aug. 8, 1892, *Kennedy ?* (GH); Lake Aylmer, Garthby, Sept. 17, 1940, *Pease 28512* (GH). **Nova Scotia:** Antigonish, Aug. 26, 1924, *Fassett 2285* (GH); Charcoal, Pictou Co., Aug. 2, 1913, *St. John 1432* (GH); Arcadia, Yarmouth Co., July 20, 1920, *Fernald & Long 21763* (GH); Springhaven, Yarmouth Co., Oct. 8, 1920, *Fernald & Linder 21767* (GH); Tusket, Yarmouth Co., July 15, 1920, *Long & Linder 21769* (GH); Tusket Falls, Oct. 7, 1920, *Fernald & Linder 21768* (GH). **Maine:** East Livermore, Androscogin Co., 1887, *Parlin* (NEBC); Lambert Lake, Washington Co., Sept. 1, 1908, *Fernald* (NEBC); Rangeley Lake, Franklin Co., Aug., 1894, *Furbish* (NEBC); South Poland, Sept. 3, 1893, *Furbish* (NEBC); Edmunds, Washington Co., Aug. 18, 1928, *Knowlton* (NEBC). **New Hampshire:** White Mountains, in Saco River, *Tuckerman* (GH, approaching *C. heterophylla* and with comment by Engelmann—"I am at a loss about this plant, and should like to see more of it. It has the rounded plump fruit of C. Asae Grayi, but much larger than all the forms of this plant I have examined, besides it comes from a Region much north of the Habitat of Asae Grayi, and mountainous too, where I would except only C. verna. G. E. Sept. 1864;" NY); Saco River, Willey House, Carroll Co., Aug. 31, 1937, *Fassett 18822* (NEBC, WIS); Ravine House Pond, Randolph, Coös Co., Sept. 2, 1925, *Pease 19895* (NEBC); Watson Pond, Randolph, Sept. 20, 1904, *Pease 4170* (NEBC); S. Lake, Carter Notch, Bean Purchase, Coös Co., Aug. 2, 1932, *Pease 22999* (NEBC, GH); brook near Lake Winnepesaukee, Alton, Aug. 4, 1909, *Sargent 84* (GH—approaching *C. heterophylla* in some fruits); Newport, Sept. 15, 1899, *Robinson 913* (GH); Dismal Pool, White Mts., Aug. 26, 1882, *Faxon* (GH, NEBC marked "near Glen Ellis . . . Pinkham Notch"); Peterboro, Hillsboro Co., Aug. 10, 1909, *Deane & Batchelder* (NEBC); Rindge, Aug. 8, 1918, *Batchelder* (NEBC). **Vermont:** Lake of the Clouds, Mt. Mansfield, Aug. 6, 1877, *Faxon* (GH). **Massachusetts:** pond on summit of Mt. Wachusett, Princeton, Aug. 8, 1894, *Collins* (GH); Mt. Wachusett, Aug. 16, 1894, *Bailey* (NEBC). **New York:** Colton Flow, Raquette River, St. Lawrence Co., Sept. 2, 1933, *Muenscher & Clausen 3910* (GH). **Georgia:** Little Stone Mountain, shallow pools along Covington Road, 20 miles east of Atlanta, DeKalb Co., April 17, 1936, *Svenson 7507* (GH). **Utah:** Diamond Lake west of Bald Mountain, Aug. 10, 1941, *Harrison 10461* (UC); Duck Lake, N. W. slope Lamotte Peak, Summit Co., Aug. 15, 1933, *Hermann 5929* (MO, UC—identification not positive). **Alaska:** Smith's Dry Lake, Attu Is., Aleutians, Sept. 14, 1945, *Hardy 387* (UC, MO); Seward Peninsula, north coast, Buckland River, 26 miles above delta, 66° N., 161° 4′ W., Sept. 7–10, 1926, *Porsild & Porsild 1595* (US). **Washington:** Mt. Ranier, alt. 5500 ft., Oct. 14, 1895, *Allen 185* (NY, US, GH, MO, CM, UC).

In reporting *C. anceps* from Mt. Mansfield, Vermont, its author[1] wrote: "In the original discussion the following possibly

[1] Rhodora 35: 185–186. 1933.



16. *C. anceps* (also in the Aleutian Islands).

helpful phrase occurs: 'distinguished from *C. heterophylla* by its small size, uniform foliage, ancipital stem, and promptly deciduous styles.' Subsequently plants with dilated foliage have been found but the ancipital stems and caducous styles are distinctive." The ancipital stems may be distinctive in the fresh plants, but in both *C. anceps* and *C. heterophylla,* as well as in most of the Sect. Callitriche, the stems press very flat and thin with the

central cylinder easily distinguishable; in the pressed condition no difference can be seen except that the stem of *C. anceps* averages a little more slender than that of *C. heterophylla*. Styles may be either caducous or persistent in both species. That *C. anceps* is generally smaller and more delicate than *C. heterophylla* may be seen from a comparison of Figs. 1–9, Plate 1168, with Figs. 1–10, Plate 1169, however, this difference is not such that it can be reduced to contrasting measurements of widths of leaves or thicknesses of stems.

The most fundamental difference between *C. heterophylla* and *C. anceps* appears to be in the shape of the fruit. In the former, the fruit is slightly narrower below the middle than above the middle (Figs. 13a, 13d, 13e, 13g, 13m, 13x) while in *C. anceps* they are essentially the same width below as above the middle (Figs. 16b, 16d, 16f, 16h, 16i). Magnification of 15–20 times is necessary for proper observation of this character. At least as much magnification is also necessary to examine the tips of the linear submersed leaves, whose veins are slightly more excurrent in *C. anceps* (Fig. 16e) and *C. hamulata* (Fig. 15d) than in *C. heterophylla* (Figs. 13h, 13s, 13An, 13Ao).

C. anceps has been confused with *C. hamulata* and *C. verna* in Greenland. In Newfoundland, it has commonly been identified as *C. heterophylla*, and most of what has been called *C. heterophylla* in Nova Scotia proves to be *C. anceps*.

While most *C. anceps* is sufficiently distinct from *C. heterophylla* on these fundamental, albeit minute, characters, a few individuals in Newfoundland and in New Hampshire show some approach to *C. heterophylla*. Sometimes this is due to distortion of young fruits in pressing, but occasionally mature fruits are intermediate, or approach both forms on the same plant. Conversely, much of the *C. heterophylla* from the Pocono Plateau in Pennsylvania shows a strong tendency toward *C. anceps*.

To a large extent, *C. anceps* combines the characters of the northern and European *C. hamulata* with the more southern *C. heterophylla;* the shape of the fruit, the nature of the leaf tip, and the general slenderness of the plants are a close match for the former, while the ascending styles and lack of wing on the carpels agrees with the latter.

17. **C. nubigena,** n. sp., fructibus subrotundis, 0.7–1.2 mm. diametro, sessilibus vel subsessilibus; mericarpellis nitidis, marginibus angulatis non alatis. —Fruit nearly round (Figs. 17a, 17e), 0.7–1.2 mm. in diameter, sessile or nearly so; faces of mericarps rather plump (Figs. 17b, 17f), and margins angled but not winged; commissural groove widely V-shaped; aquatic forms with long lax stems and submersed linear 1-nerved leaves, submersed spatulate leaves, and submersed or floating rotund petioled leaves occurring in different combinations on different plants; subterrestrial plants mat-like on the mud, with spatulate or oblanceolate or obovate leaves.— **Colombia:** Department Santander: pool on paramo, Alto del Almorzadero, north of Cerrito, alt. 12000 ft., Oct. 12, 1944, *Fassett 25918* (TYPE in MO; ISOTYPE in GH), and *25916* (WIS, CM, NY, US, MO); aquatic form in 20 cm. water, pool in pasture, "Moravia," a level valley northeast of LaBelleza, valley of Rio Minero near Florian, alt. 7000 ft., Sept. 26, 1944, *Fassett 25808* (GH, MO), and subaquatic form, *25809* (GH, MO), and terrestrial form on mud, *25807* (GH, MO); small shallow pool, half-way between Sucre and LaBelleza, alt. 7650 ft., Sept. 25, 1944, *Fassett 25796* (WIS, UC, US, CM).

These collections are from two regions about 125 miles apart, and perhaps represent two species if we may judge from the sizes of the fruits. Collections nos. 25918 and 25916 are from the Alto del Almorzadero, some 35 miles southeast of Bucaramanga. Here is treeless paramo at 12000 feet elevation, bleak, cold and fog-drenched. The plants grew in a pool not over 100 feet across. The fruits on these collections are from 9–12 mm. high and wide.

The other collections are from a region called "Moravia," about 25 miles southwest of Vélez. The elevation is only about 7000 feet. The valley has low eroded sandstone cliffs along the sides, and the valley-floor is flat with a meandering stream with steeply cut banks and occasional old oxbows. The sides are wooded, while the floor is more open and pastured, with pools or sedge and marsh vegetation in the oxbows. To the writer's eye, the superficial resemblance to the valleys in Wisconsin's Driftless Area was striking. The *Callitriche,* growing in and around a shallow oxbow pool, has fruits only 0.7–0.8 mm. high and wide.

The difference in size of fruits is consistent with diflerences between some species. On the other hand, this variation is well within the size ranges in *C. heterophylla* in California. With effectively only two collections available it seems wiser to take the more conservative course at present.

18. **C. Lechleri** (Hegelm.) n. comb. *C. marginata γ Lechleri* Hegelm. Verhandl. Bot. Ver. Brandenburg 9: 12. 1867.—Fruit 1.0–1.4 mm. wide, 1.0–1.2 mm. high, the width equalling or, more frequently, slightly exceeding the

height; carpels distinctly winged (Figs. 18a, 18d, 18e, 18g, 18k); mericarps with plump faces (Figs. 18b, 18e, 18f, 18h) and with a wide V-shaped commissural groove; leaves and habit variable, essentially as described under *C. heterophylla*.

a. Fruits sessile or nearly so. . . . . *C. Lechleri* var. *Lechleri*.
a. Fruits peduncled. . . . . *C. Lechleri* var. *Berteroana*.

C. Lechleri var. **Lechleri.** *C. marginata* γ *Lechleri* Hegelm. l. c.—Central and southern Chile and adjacent Argentina.—**Chile:** Rancagua, May, June, 1828, *Bertero 142* (mo, gh, ny—Cotypes); 40 Kilom. al Este de Valparaíso, January, 1916, *Jaffuel 357* (gh, mixed with var. *Berteroana*); San Miguel, Concepcion, Nov. 11, 1933, *Barros 125* (gh); Temuco, Prov. Cautin, about 120 m. alt., Dec. 15, 1935, *Montero 2589* (gh); Valdivia, ex herb. John Ball (gh); Costa, Nov. 4, 1920, *Claude-Joseph 1232* (us); Volcan Tolguaca, Prov. Malleco, Feb. 23–25, alt. 1200 m., *Pennell 12795* (cm). **Argentina:** Cordilleras del Chubut, Feb., 1903, *Illin* (uc); Rio Corcovado, Território del Chubut, March 8, 1901, *Illin 113* (sp); Prov. Magallanes, Jan., 1931, *Hicken 487* (gh); región del Lago Nahuel Huapí, Bariloche, Feb. 12, 1940, *Cabrera 6097* (lp).

C. Lechleri var. **Berteroana** (Hegelm.) n. comb. *C. Berteroiana* Steud. Nom. ed. 2, 1: 259. 1840, *nomen nudum* but a type cited. *C. marginata* β *Berteroana* Hegelm. l. c. *C. Berteroana* Steud. ex Hegelm. l. c., in synonymy. —Central **Chile:**—Rancagua, *Bertero 141* (Isotype of *C. Berteroiana* Steud.—gh, mo); without locality, *Gay* (mo); 40 Kilom. al Este de Valparaíso, Jan. 1916, *Jaffuel 357* (gh, mixed with var. *Lechleri*); Valle de Marga-Marga, Prov. Aconcagua, southeasterly from Valparaiso, *Jaffuel & Pirion 3208* (gh).

Plate 1174

(Numbers same as in keys and descriptions)

15. *C. hamulata.* 15a. Cross-section of fruit, × 30. Greenland, *Porsild* on 13 Aug. 1932 (US). 15b. Face of fruit, portion of stem and leaves, × 30. Same collection. 13c. Edge view of fruit, × 30. Same collection. 13d. Leaf tip, × 30. Same collection.

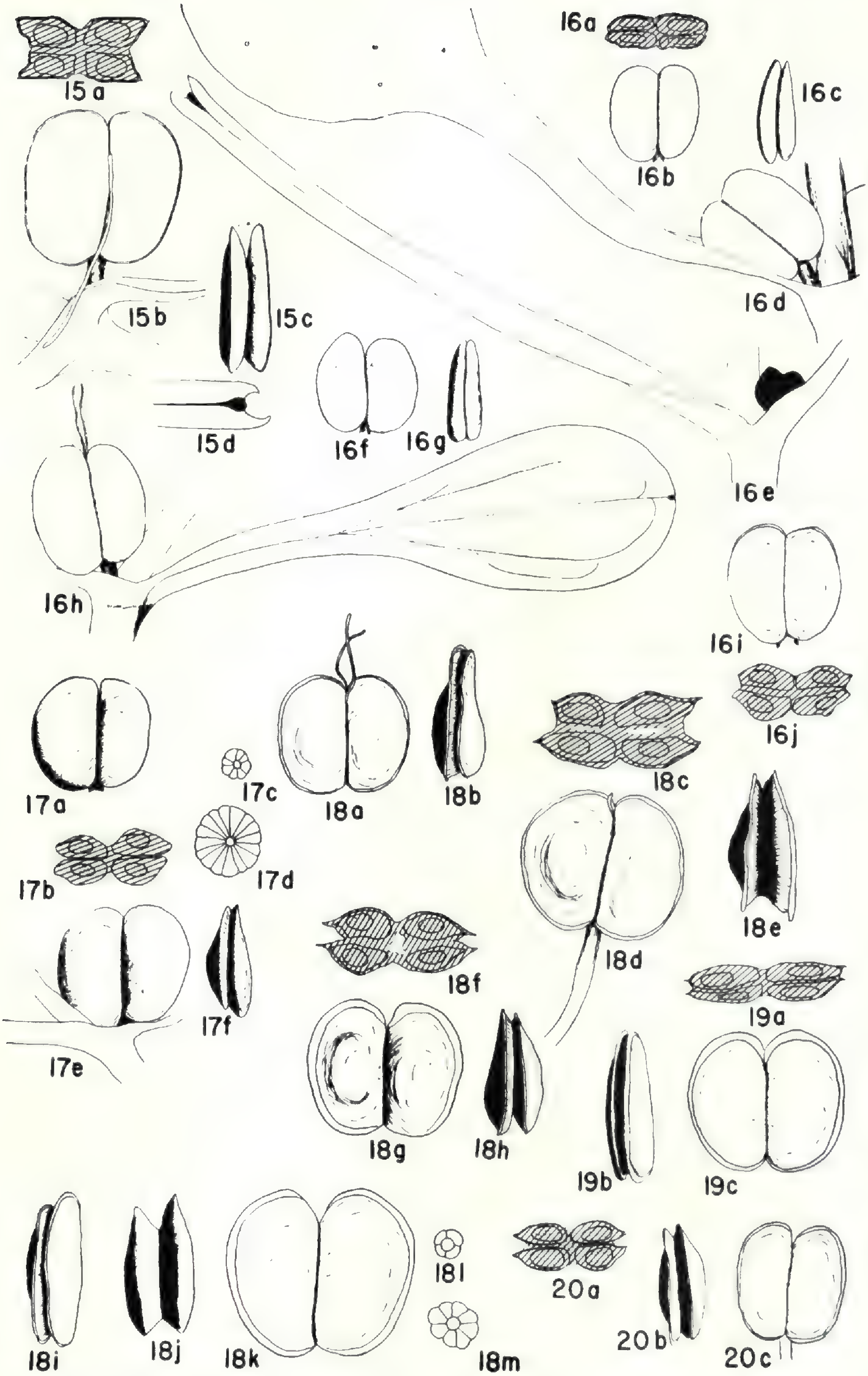
16. *C. anceps.* 16a. Cross-section of fruit, × 30. Quebec, *Fernald, Dodge & Smith 25878* (GH). 16b. Face of fruit, × 30. Same collection. 16c. Edge view of fruit, × 30. Same collection. 16d. Face of fruit, and part of leaf and stem, × 30. New Hampshire, *Robinson* (GH). 16e. Young fruit, part of stem, and linear 1-nerved leaf, × 30. Quebec, *Fernald & Smith 25877* (GH). 16f. Face of fruit, × 30. Labrador, *Fernald & Long 28642* (GH). 16g. Edge view of fruit, × 30. Same collection. 16h. Face of fruit, leaf and portion of stem, × 30. Nova Scotia, *Fernald & Linder 21767* (GH). 16i. Face of fruit, × 30. New Hampshire, *Faxon* (GH). 16j. Cross-section of fruit, × 30. Same collection.

17. *C. nubigena.* 17a. Face of fruit, × 30. Colombia, *Fassett 25807* (WIS). 17b. Cross-section of fruit, × 30. Colombia, *Fassett 25918* (WIS). 17c. Peltate scale from leaf, × 187.5. Colombia, *Fassett 25796* (WIS). 17d. Peltate scale from leaf, × 187.5. Same collection. 17e. Face of fruit, × 30. Colombia, *Fassett 25918* (WIS). 17f. Edge view of fruit, × 30. Same collection.

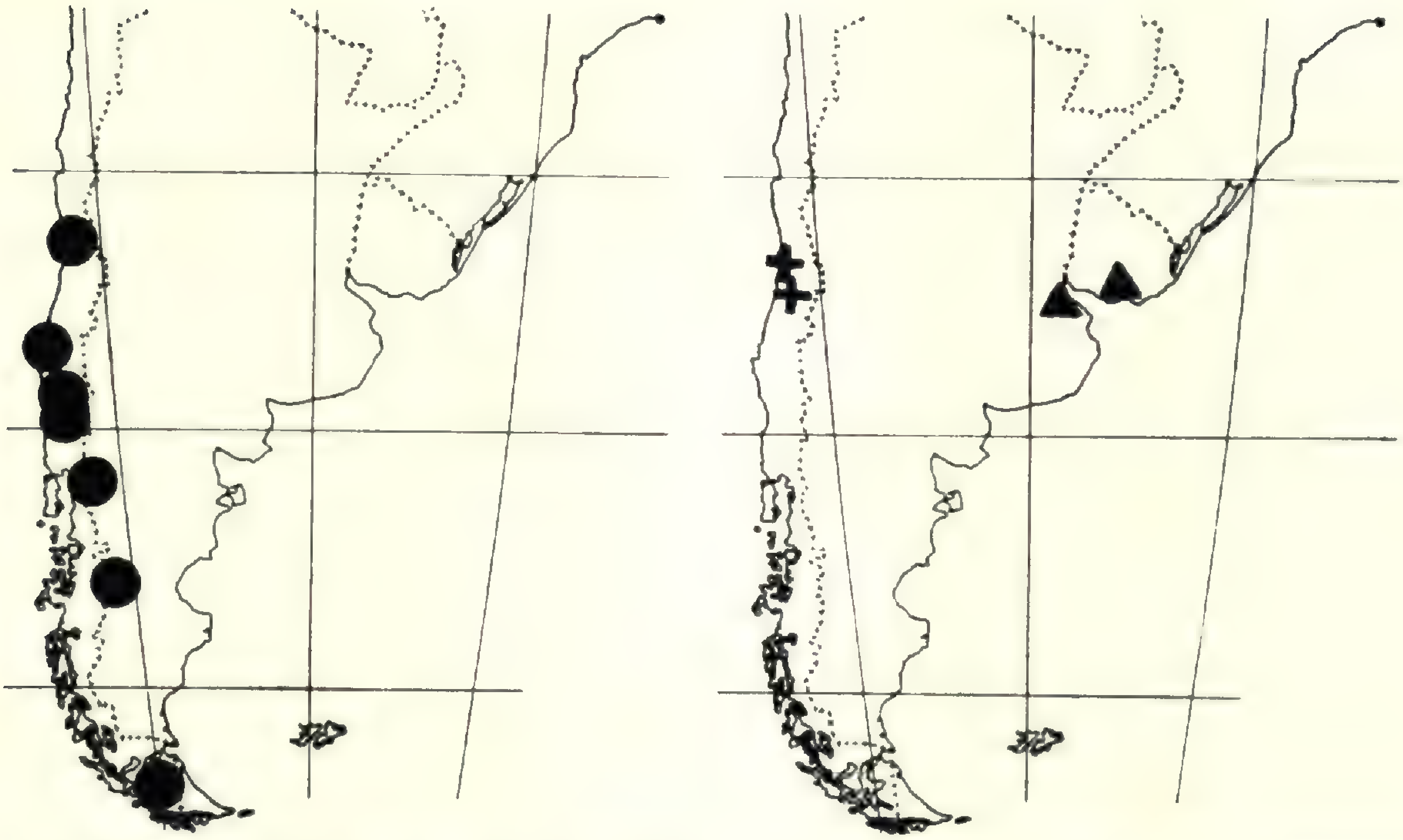
18. *C. Lechleri.* 18a. Face of fruit, var. *Lechleri*, × 30. Chile, *Barros 125* (GH). 18b. Edge view of fruit, × 30. Same collection. 18c. Cross-section of fruit, var. *Berteroana*, × 30. Chile, *Jaffuel & Piron 3208* (GH). 18d. Face of fruit, × 30. Same collection. 18e. Edge view of fruit, × 30. Same collection. 18f. Cross-section of fruit, var. *Berteroana*, × 30. Chile, *Jaffuel 357* (GH). 18g. Face of fruit, × 30. Same collection. 18h. Edge view of fruit, × 30. Same collection. 18i. Edge view of fruit, var. *Berteroana*, × 30. Chile, *Bertero 141* (GH). 18j. Edge view of fruit, × 30. Same collection. 18k. Face of fruit, × 30. Same collection. 18l. Peltate scale from leaf, × 187.5. Same collection. 18m. Peltate scale from leaf, × 187.5. Same collection.

19. *C. trochlearis.* 19a. Cross-section of fruit, × 30. California, *Harris, Tracy & Yates 3454* (US). 19b. Edge view of fruit, × 30. Same collection. 19c. Face of fruit, × 30. Same collection.

20. *C. oblongicarpa.* 20a. Cross-section of fruit, × 30. Argentina, *Parodi 8571* (GH). 20b. Edge view of fruit, × 30. Same collection. 20c. Face of fruit, × 30. Same collection.



CALLITRICHE. 15, C. XAMULATA. 16, C. ANCEPS. 17, C. NUBIGENA. 18, C. LECHLERI. 19, C. TROC. LEARIS. 20, C. OBLONGICARPA.



18 (left). *C. Lechleri* var. *Lechleri* (dots). 18a (right). *C. Lechleri* var. *Berteroana* (crosses). 20 (right). *C. oblongicarpa* (triangles).

The taxonomy of *C. Lechleri* has had a history of confusion. According to Hegelmaier, as previously stated in this paper under *C. turfosa*, these plants were treated by Bertero as conspecific with *C. turfosa*. Hegelmaier separated the two varieties of *C. Lechleri* from *C. turfosa*, but he treated them as varieties under *C. marginata*.

Now *C. Lechleri* is of the Sect. *Callitriche*, while both *C. turfosa* and *C. marginata* belong to the Sect. *Microcallitriche*. It happens that many fruits of *C. Lechleri* are broader in relation to their height than is the case in most of the *Callitriche*, and the mistake was a natural one. It was the writer's experience to soften and dissect many plants, and to boil many leaves in alcohol and stain for peltate scales, before he reached the conclusion that both sections were represented in the jumble of superficially similar plants finally separated into *C. turfosa*, *C. Lechleri*, *C. oblongicarpa* and *C. rimata*.

C. Berteroiana Steud. was a *nomen nudum*, but his single cited specimen, *Bertero 141*, clearly fixes the application of the name. Hegelmaier used the name in connection with a description, which would have validated it had he not cited it as a synonym of *C. marginata* β *Berteroana*. It seems better, after two still-

births, to let it lie in its grave and treat the plant as *C. Lechleri* var. *Berteroana,* basing the name on Hegelmaier's use in the varietal category.

Hegelmaier's descriptions of *C. turfosa, C. marginata γ Lechleri* and *C. marginata β Berteroana* are insufficient in diagnostic characters to set definitely the applications of the names. A few of the most critical of the cited specimens have been seen, and used to fix the applications of names.

19. **C. trochlearis,** n. sp., fructibus rotundis, 1.0–1.2 mm. diametro; marginibus mericarpellorum manifeste alatis, faciebus planis.—Fruit nearly round, 1.0–1.2 mm. in diameter; mericarps distinctly winged (Figs. 19a, 19b, 19c), with flat or slightly plump faces, and a shallow U-shaped commissural groove (Fig. 19a); aquatic forms with linear 1-nerved leaves below, broader subpetiolate leaves at the upper internodes and in a floating rosette; stranded plants forming a mat on the mud, with spatulate leaves.—Coast Ranges of **California:** Buck Mt., 2700 ft. elevation, Humboldt Co., June 17, 1936, *Harris, Tracy & Yates 3454* (TYPE in GH, ISOTYPE in US); Buck Mt., 2500 ft., June 17, 1936, *Tracy 14952* (UC); Eureka, Humboldt Co., May 28, 1900, *Tracy 824* (UC); Ukiah, Mendocino Co., April 18, 1866, *Bolander 4658* (MO, US, NY, UC); Cazadero, Sonoma Co., March 14, 1896, *Davy 1665* (UC).

This has been identified sometimes as *C. Bolanderi,* sometimes as *C. verna* or *C. palustris.* It somewhat resembles the former in the size of the fruit, but the fruit is more rotund; the wing resembles that of the latter but is more fully developed around the whole carpel.

20. **C. oblongicarpa,** n. sp., fructibus 0.7–0.9 mm. latitudine, 0.8–0.9 mm. altitudine, suboblongatis; mericarpellis nitidis (Fig. 20b), anguste alatis (Fig. 20c); commissura in forma V (Fig. 20a).—Fruit 0.7–0.9 mm. wide, with nearly parallel sides, the height equalling or slightly exceeding the width (Fig. 20c); mericarps narrowly and often obscurely winged, plump on the face (Figs. 20a, 20b) and with a wide V-shaped commissural groove; pedicels nearly lacking, or as long as 1 cm., variable in length on the same plant.—In the low country about the mouth of Rio de la Plata.—**Uruguay:** Minas, Oct. 3, 1937, *Rosengurt A1353* (CM). **Argentina:** La Plata, Prov. de Buenos Aires, Oct. 20, 1928, *Parodi 8571* (TYPE in GH).

The two collections both represent aquatic forms with obovate leaves, of the general type shown in Plate 1168, Fig. 2.

(to be concluded)

MAPPING RANGES OF THE TREES OF THE UNITED STATES

Elbert L. Little, Jr.

A map is the clearest and most concise method of showing accurately the geographic distribution of a plant species. In comparison the ranges by States given in manuals seem vague and incomplete. Though obviously no more accurate than the original data, a map appears so definite that it may give a false impression. A map correct to minute details would require records from an infinite number of localities.

Botanists, foresters, and other authors bold enough to summarize plant distribution records graphically may expect criticism instead of reward for their efforts. It is far easier to detect a minor flaw along a boundary line than to prepare a better map. The late Professor M. L. Fernald (1950) recently cited a number of inaccuracies in the distribution maps in Preston's North American Trees (1948). (Some of these maps have been revised in the 1950 printing of this book.)

Forest Service Tree Distribution Maps

The United States Forest Service has long been interested in the distribution of the native trees. George B. Sudworth (1898, 1927), the dendrologist for many years, summarized tree ranges in the two editions of his Check List of Forest Trees of the United States, Their Names and Ranges. Nearly a half century ago he undertook a rather large project of preparing a distribution map for each native tree species of North America, exclusive of those occurring wholly in Mexico. His assistants in a Section of Forest Distribution, chiefly W. H. Lamb, Georgia E. Wharton, and Mary C. Gannett, compiled on separate cards many thousand locality records for individual species, based upon published botanical lists, unpublished notes, and herbarium specimens. For each species these localities were plotted by number on a large cloth-backed contour map of North America.

Publication of these maps was begun by Sudworth (1913) under the title, Forest Atlas—Geographic Distribution of North American Trees. Only Part I—Pines, containing maps for 36

species of *Pinus*, ever appeared. However, some smaller maps of conifers, poplars, tree willows, and walnuts of the Rocky Mountain region were published in five later bulletins by Sudworth. It is unfortunate that the entire atlas, with a map for each native tree species, was not published in 1913 or soon afterwards, when the maps represented current knowledge. Sudworth's maps were compiled in the old days when field work was largely by horse and buggy, horseback, of foot from points along railroads and before the modern era of botanical exploration by automobile travel over networks of highways. Now these old maps are so far out-of-date that their value is chiefly historical.

Munns' Distribution of Important Forest Trees of the United States (1938) consisted of 170 maps, one for each important native tree species. These maps were based largely upon Sudworth's data and more recent data compiled from various publications by William W. Mitchell and others. This publication has been criticized because of various inaccuracies in the maps but was sufficiently popular to be reprinted. Incidentally, some errors noted by Professor Fernald in Preston's book appear to be traceable to these older, Forest Service maps.

Most of Munns' maps were redrafted on a smaller scale and often with slight revisions in the Forest Service series of leaflets known as American Woods, by Betts (1945). Areas of greatest commercial production were shown for several species.

Fairly accurate small distribution maps of many native tree species of the United States can now be prepared from existing published records. My first efforts, 165 small maps, appeared in my article, Important Forest Trees of the United States (Little, 1949a), in Trees, the Yearbook of Agriculture, 1949 (also reprinted as Yearbook Separate No. 2156), and may have been unnoticed by Professor Fernald.

These small yearbook maps were compiled hastily to meet a publication deadline from about 200 published references, supplemented by my own field experience in a few states. Sargent's Manual (1926) and Sudworth's Check List (1927) naturally were consulted, and maps of a few species were found in monographs and special publications. Blake and Atwood's (1942) bibliography of floras was an invaluable aid for location of references and was supplemented for recent titles by the excellent Botanical

Catalog in card form in the United States Department of Agriculture Library. The best publications for tree ranges in every state, chiefly state tree manuals and state floras, were examined. Very helpful published tree distribution maps were found for a few states, such as Illinois, Indiana, Kansas, Nebraska, and Wisconsin. Some local floras were checked, especially in states lacking modern state tree bulletins or floras. Where gaps occurred in the records, vegetation maps (Zon and Shantz, 1924), topographic maps, and a map of the counties in the United States were useful. Lack of time did not permit circulation of preliminary maps to interested critics, search for scattered published notes on range extensions, or examination of herbarium specimens.

Ranges in southern Canada were obtained from maps in Native Trees of Canada by the Canada Dominion Forest Service (1933; also revised in 1949), from Halliday and Brown (1943), and from floras of each province. Distribution in Mexico was not shown because of the limited, scattered published references available. Alaska was omitted, but the few tree species there have been mapped by Hultén (1941–1949).

Some excellent maps of forest types and tree distribution in certain states have been prepared in recent years by the U. S. Forest Service through its Forest Survey. Professor Fernald (1950) criticized Preston's (1948) first map, Forest Regions and Principal Types of Forest in the United States (credited by Preston to the Forest Service), because it did not show the pine forests of New England and New York. The revised Forest Service map of 1949, Areas Characterized by Major Forest Types in the United States, does show these pine forests of New England and New York!

Though most Forest Survey maps illustrate forest types, tree distribution maps of commercial forest trees have been published for a few states; for example, by Roberts and Cruikshank (1941a, 1941b) on North Carolina and South Carolina, by Evans (1942) on Virginia, and by Sternitzke and Duerr (1950) on Mississippi. These accurate maps showing by dots the density of occurrence of merchantable timber, rather than botanical or commercial range, were based upon intensive field surveys and measurements on thousands of uniformly spaced sample plots and upon infi-

nitely more field records than earlier maps. However, some maps of forest resources combined two or more related species having woods not distinguished commercially, such as all species of hickory, all species of ash, or all species of red oaks. Tree species of minor importance were not mapped.

Problems and Methods in Making Tree Distribution Maps

All who have prepared distribution maps of plant species are aware of the problems and difficulties involved. Maps of medium size no larger than an ordinary book page, such as commonly used in taxonomic monographs, probably are best for most purposes where space limits of the publication permit. Small maps, such as those of a field manual, sacrifice detail. However, large maps magnify inaccuracies and may not be better unless their base is also more detailed. As long as the exact limits of many native tree species are not accurately known within as much as 50 to 100 miles in less explored parts of their ranges, large maps are not justified.

The simplest kind of map, commonly employed in taxonomic monographs, is that based upon herbarium specimens, with a dot or other symbol representing each locality of record. This reliable map reveals clearly the supporting data and makes no attempt to fill in the gaps. However, a map limited to specimens shows where collectors have been rather than the various other places where the trees grow. These dot maps are satisfactory for many species of small and inconspicuous plants of interest primarily to specialists. More detailed maps are needed for trees, because of their size, dominance in the vegetation and landscape, economic importance, and widespread public interest.

On a map of a single state, distribution by counties can be shown clearly by a dot in each county of known occurrence. This method is adequate in states with small counties and where much collecting has been done, as illustrated by Gates (1938) in Kansas and Deam (1932) in Indiana. In states with numerous small counties some sight records may be substituted for specimens to save time and labor. Duncan (1950) in Georgia used a special type of card to simplify preparation of maps from sight records. Naturally maps based upon county records alone are

less accurate in the large western States with few counties and diverse topography.

The dot method was applied to the grasses of the United States by Hitchcock (1935; revised 1951) who used a small map of the United States for each species with a dot in each state where the species was known. This graphic summary of occurrence by states in addition to the usual text range might well be adopted by regional floras, including the next edition of Gray's Manual, and is being considered for the less important tree species in the forthcoming Forest Service Check List of the Native and Naturalized Trees of the United States.

Another simple method of mapping distribution is by a line along the species boundaries with one or several species on a map. However, isolated stations and areas within the main range where the species is absent cannot be shown clearly.

One of the best types is a small map of the United States on which distribution of a tree species is indicated by a dotted or stippled area. Dots are more natural than a line because the range limit is not a sharp line. If every tree were shown on a large scale map of a small area, the map would usually consist of dots with a border of scattered dots. Authors adopting this type for trees include: Hough (1907), Seton (1912), Mathews (1915), Preston (1940, 1948), Jacques (1940), Harlow and Harrar (1941), and Little (1949a).

Where two colors are permitted the range can be shown by a colored overlay on a black and white base map containing locality details. For example, a solid green overlay was used by Sudworth (1913 and later publications), Benson and Darrow (1945), and the Canada Dominion Forest Service (1949).

It is not easy to transfer the distribution limits of a tree species to a map, even after field observations. Inconspicuous individuals may be scattered many miles beyond the boundary of a certain forest type. On a small scale map outlying stations must be exaggerated, consolidated, or omitted because of cartological difficulties. Different persons using the same data might not compile identical maps. Boundaries of range in publications of adjacent states sometimes do not coincide. Minute details of some maps, such as restriction of certain species of moist sites to strips along the larger streams, tracing of boundaries exactly

from contour lines in mountains, and irregular dotted masses near range limits, imply an accuracy probably unwarranted by the basic data.

The distribution of several native tree species is complicated by cultivation, escaping, and naturalization beyond the original ranges. Where records are sufficient both the native and naturalized ranges should be distinguished on the same map. Other species may have become extinct in isolated stations or small portions of their natural range through destruction of habitats or cutting. Regions where exotic species or native species can be cultivated may be summarized by reference to numbered zones on a base map of the United States. Mulford's map of plant growth regions of the United States was adopted by Van Dersal (1938) for the ranges of native woody plants. Maps of hardiness zones based upon average annual minimum temperatures have been used by Rehder (1927), Little (1949b), and others.

Ordinarily density or abundance is not indicated on tree distribution maps except those based upon forest surveys. However, published maps of forest types or vegetation show distribution of the dominant tree species and indirectly the areas of greatest economic occurrence except on the vast areas where the forests have been destroyed.

Future Work

An atlas showing the distribution of each native tree species in the United States is still needed, and further delays may increase the difficulties of mapping.[1] The U. S. Forest Service, which had no dendrologist after Sudworth's death in 1927 until 1942, is the logical center for this work. As Sudworth (1913) remarked, the cooperation of many persons is needed, because no one can hope to accomplish this task from his own observations alone. During the next few years and with the assistance of Forest Service field personnel and others, I plan to compile distribution maps of each native tree species in the United States on a medium scale for publication in a single volume. The preliminary maps can be

[1] Useful, generalized distribution maps of the tree species of temperate North America and Eurasia, excluding small and shrubby trees, have been published by Theodor Schmucker (The Tree Species of the Northern Temperate Zone and Their distribution. Silva Orbis No. 4, 156 pp., illus. 1942). However, the 250 small-scale maps showing species boundaries by lines of different kinds lacked country and state boundaries and were below the desired standards of accuracy.

circulated in advance to a limited number of interested persons for revision. Of course, the published maps will be available to all who wish to use them, such as writers of tree books, just as Forest Service photographs and drawings of trees now are.

Suggestions and information for this project will be welcome. Instead of condemning further the inaccurate tree distribution maps already published, those interested should help make better ones. The greatest need now is for more articles or bulletins devoted to distribution maps of native tree species in a single state and prepared by an experienced resident botanist or forester. Published tree distribution records of some states still are rather meager and insufficient for plotting. Botanists and foresters are urged to publish at an early date articles containing their records on range extensions of trees from their collections, herbaria, or observations. (I should be very glad to receive reprints.) Duplicate specimens confirming these records should be deposited in one or more large herbaria as well as in the state or institution herbarium.

Corrections and range extensions of the 165 small maps in my yearbook article are welcome, as mentioned on page 764. I shall be glad to send two copies of Yearbook Separate No. 2156 to any interested persons who will be kind enough to return one copy with any corrections and range extensions marked on the maps with colored pencil (or shown on larger maps). (Yearbook Separate No. 2156 is also for sale by the Superintendent of Documents, Washington 25, D. C., at 15 cents a copy.)

Forest Service, United States Department of Agriculture,
Washington 25, D. C.

Literature Cited

Benson, Lyman, and Robert A. Darrow. 1945. A Manual of Southwestern Desert Trees and Shrubs. Ariz. Univ. Biol. Sci. Bul. **6**, 411 pp., illus.

Betts, H. S. 1945. American Woods, a Series of Leaflets on Individual Species of Economically Important American Woods. U. S. Dept. Agr., Forest Service. Washington.

Blake, S. F., and Alice C. Atwood. 1942. Geographical Guide to Floras of the World. Part I. U. S. Dept. Agr. Misc. Pub. **401**, 446 pp.

Canada, Dominion Forest Service. 1933. Native Trees of Canada. Canada Dominion Forest Service Bul **61**. Revised ed., 210 pp., illus.

————. 1949. Native Trees of Canada. Canada Dominion Forest Service Bul. **61**. Ed. 4, 293 pp., illus.

Deam, Charles C. 1932. Trees of Indiana. Indiana Dept. Conserv. Pub. 13. Ed. 2, rev., 326 pp., illus.

Duncan, Wilbur H. 1950. Preliminary Reports on the Flora of Georgia. 2. Distribution of 87 Trees. Amer. Midland Nat. **43:** 742–761, illus.

Evans, T. C. 1942. The Distribution of Commercial Forest Trees in Virginia. U. S. Dept. Agr., Forest Service, Appalachian Forest Expt. Sta. Forest Survey Release **10,** 32 pp., illus.

Fernald, M. L. 1950. Why So Many Careless Books on Trees and Other Plants? Rhodora **52:** 272–279.

Gates, Frank C. 1938. Woody Plants, Native and Naturalized in Kansas. Kan. Acad. Sci. Trans. **41:** 99–118, illus.

Halliday, W. E. D., and A. W. A. Brown. 1943. The Distribution of Some Important Forest Trees in Canada. Ecology **24:** 353–373, illus.

Harlow, William M., and Ellwood S. Harrar. 1941. Textbook of Dendrology Covering the Important Forest Trees of the United States and Canada. Ed. 2, 542 pp., illus. New York and London. (Ed. 3, 555 pp., illus. 1950.)

Hitchcock, A. S. 1935. Manual of the Grasses of the United States. U. S. Dept. Agr. Misc. Pub. **200,** 1040 pp., illus. (Ed. 2, revised by Agnes Chase, 1051 pp., illus. 1951.)

Hough, Romeyn Beck. 1907. Handbook of the Trees of the Northern States and Canada East of the Rocky Mountains. 470 pp., illus. Lowville, N. Y.

Hultén, Eric. 1941–1949. Flora of Alaska and Yukon. Lunds Univ. Årsskr., N. F., Avd. 2, **37** (1): 1–27, illus.; **38** (1): 129–412, illus; **39** (1): 413–567, illus.; **40** (1): 569–795, illus.; **41** (1): 797–978, illus.; **42** (1): 979–1066, illus.; **43** (1): 1067–1200, illus.; **44** (1): 1203–1341, illus.; **45** (1): 1343–1481, illus.

Jacques, H. E. 1940. How to Know the Trees. 152 pp., illus. Mt. Pleasant, Iowa. (Revised ed., 166 pp., illus. 1946. Dubuque, Iowa.)

Little, Elbert L., Jr. 1949a. Important Forest Trees of the United States. Pp. 763–814, illus. *In* Trees, the Yearbook of Agriculture, 1949. U. S. Dept. Agr. 944 pp., illus. Washington, D. C. (Reprinted in 1950 as Yearbook Separate No. 2156.)

————. 1949b. Fifty Trees from Foreign Lands. Pp. 815–832, illus. *In* Trees, the Yearbook of Agriculture, 1949. U. S. Dept. Agr. 944 pp., illus. Washington, D. C.

Mathews, F. Schuler. 1915. Field Book of American Trees and Shrubs. 465 pp., illus. New York and London.

Munns, E. N. 1938. The Distribution of Important Forest Trees of the United States. U. S. Dept. Agr. Misc. Pub. **287,** 176 pp., illus.

Preston, Richard J., Jr. 1940. Rocky Mountain Trees. 285 pp., illus. Ames, Iowa. (Ed. 2, 285 pp., illus. 1947.)

————. 1948. North American Trees (Exclusive of Mexico and Tropical United States). 371 pp., illus. Ames, Iowa. (Reprinted with revised maps, 1950.)

Rehder, Alfred. 1927. Manual of Cultivated Trees and Shrubs Hardy in North America. 930 pp., map. New York. (Ed. 2, 996 pp., map. 1940.)

Roberts, E. V., and J. W. Cruikshank. 1941a. The Distribution of Commercial Forest Trees in North Carolina. U. S. Dept. Agr., Forest Service, Appalachian Forest Expt. Sta. Forest Survey Release **8,** 27 pp., illus.

————. 1941b. The Distribution of Commercial Forest Trees in South Carolina. U. S. Dept. Agr., Forest Service, Appalachian Forest Expt. Sta. Forest Survey Release **9**, 20 pp., illus.

Sargent, Charles Sprague. 1926. Manual of the Trees of North America (Exclusive of Mexico). Ed. 2 with corrections, 910 pp., illus. Boston and New York.

Seton, Ernest Thompson. 1912. The Forester's Manual; or, The Forest Trees of Eastern North America. 141 pp., illus. Garden City, N. Y.

Sternitzke, Herbert S., and William A. Duerr. 1950. Tree Distribution in Mississippi. U. S. Dept. Agr., Forest Service, Southern Forest Expt. Sta. Forest Survey Release **64**, 19 pp., illus.

Sudworth, George B. 1898. Check List of the Forest Trees of the United States, Their Names and Ranges. U. S. Dept. Agr., Div. Forestry Bul. **17**, 144 pp.

————. 1913. Forest Atlas. Geographic Distribution of North American Trees. Part I—Pines. U. S. Dept. Agr., Forest Service. 36 maps.

————. 1927. Check List of the Forest Trees of the United States, Their Names and Ranges. U. S. Dept. Agr. Misc. Cir. **92**, 295 pp.

Van Dersal, William R. 1938. Native Woody Plants of the United States, Their Erosion-Control and Wildlife Values. U. S. Dept. Agr. Misc. Pub. **303**, 362 pp., illus.

Zon, Raphael, and H. L. Shantz. 1924. Natural Vegetation. *In* Atlas of American Agriculture. Pt. I, Sect. E, 29 pp., illus. U. S. Dept. Agr., Bur. Agr. Econ.

CHROMOSOMES OF SPIRAEA AND OF CERTAIN OTHER GENERA OF ROSACEAE

J. T. Baldwin, Jr.

Chromosome numbers determined for various American—and one introduced—representatives of Rosaceae are recorded in Table I. Only plants of known geographic source are included. Counts were readily made from leaf smears. Diploid, tetraploid, and hexaploid expressions of a 9-series were found. Species previously in the chromosomal literature are discussed; others are merely listed in the table. Specimens collected by the author and cited are in the herbaria of U. S. National Arboretum and of the Smithsonian Institution. Those collected by Clover and Jotter are in the Herbarium of the University of Michigan.

Spiraea

Spiraea, a genus of about fifty species in the temperate zone of the northern hemisphere (Willis, 1948), is, of course, an assemblage of considerable horticultural importance. The relatively

TABLE I

	2n	Collector & No.
Spiraea alba Du Roi		
Virginia		
Fauquier Co.: near Paris	36	Baldwin 5603
Maryland		
Garrett Co.: Backbone Mountain	36	Baldwin 5650
West Virginia		
Grant Co.: Mount Storm	36	Baldwin 5645
Preston Co.: Masontown	36	Baldwin s. n.
Tucker Co.: Thomas	36	Baldwin s. n.
Spiraea latifolia (Ait.) Borkh., var. *septentrionalis* Fernald		
Virginia		
Page Co.: Hawksbill Mountain	54	Baldwin 5464, 5601
Spiraea tomentosa L., forma *albiflora* Macbr.		
Pennsylvania		
Crawford Co.: near Meadville	36	A. Lorz s. n.
Spiraea japonica L. f.		
Virginia		
Clarke Co.: near Paris	36	Baldwin 5668
Spiraea corymbosa Raf.		
Virginia		
Rappahannock Co.: Skyline Drive	36	Baldwin 5630
Warren Co.: Skyline Drive	36	Baldwin 5627
Physocarpus opulifolius (L.) Maxim.		
Virginia		
Clarke Co.: along Shenandoah River	18	Baldwin s. n.
Frederick Co.: Gore	18	Baldwin 5653
West Virginia		
Hampshire Co.: Romney	18	Baldwin 5654
Preston Co.: Masontown	18	Baldwin s. n.
Gillenia trifoliata (L.) Moench		
Virginia		
Clarke Co.: near Paris	18	Baldwin 5667
Rappahannock Co.: Skyline Drive	18	Baldwin 5632
Warren Co.: Skyline Drive	18	Baldwin 5633
Maryland		
Garrett Co.: Oakland	18	Baldwin 5640
West Virginia		
Grant Co.: Gormania	18	Baldwin s. n.
Hampshire Co.: Romney	18	Baldwin 5642
Neviusia alabamensis Gray		
Alabama		
Tuscaloosa Co.: near Tuscaloosa	18	Baldwin s. n.
Fallugia paradoxa (D. Don) Endl.		
Arizona: 26 miles below Lee's Ferry*	18	E. U. Clover & L. Jotter 2225
Cowania Stansburiana Torr.		
Arizona: Hermit Creek*	18	E. U. Clover & L. Jotter 2303A

* See map in Clover and Jotter (1941).

few chromosomal data now available for the genus indicate that a cytogeographic survey of *Spiraea* should be made: many problems in evolution would doubtless be thereby resolved; plants of significant value for breeding would probably be discovered. An example illustrates the point. Sax (1936) stated

that *S. corymbosa* has been used in making several interspecific hybrids and that this species "is a triploid with complete pollen sterility. It must form viable egg cells or exist in a fertile diploid form . . ." Perhaps diploid representatives do exist in *S. corymbosa.* Tetraploid ones do: along the Skyline Drive in Virginia the species is tetraploid. This information affords basis for interpreting certain of the artificial hybrids to which Sax referred. Existence of polyploidy within species makes it possible to build up a long series of horticultural plants.

Six species, two varieties, and one form of *Spiraea* are included in the eighth edition of Gray's Manual. Of the species only *S. virginiana* has not been cytologically studied.

Sax (1936) and the present author have found *S. alba* to be tetraploid. But, as stated above, Sax found *S. corymbosa* to be triploid, not tetraploid as reported here. And he found *S. japonica* to be diploid, and not tetraploid as it is in Clarke County, Virginia, where the species has become naturalized. Sax found *S. latifolia* to be tetraploid; its variety *septentrionalis* in Virginia (Baldwin, 1946) is hexaploid. *S. tomentosa* var. *alba* West as published by Bowden (1945) with an *n*-number of 18 and *S. tomentosa* forma *albiflora* given here with $2n = 36$ are designations of the same collection.

Hexaploidy in *Spiraea* is seemingly infrequent. Sax (1936) stated that *S. myrtilloides*, an Old World species, is hexaploid and that *S. Billiardii*, an artificial hybrid of two American species, may be hexaploid. The present author found a pink-spiked plant of undetermined identity cultivated at The Blandy Experimental Farm, Boyce, Virginia, to be hexaploid. *S. latifolia* var. *septentrionalis* atop Hawksbill Mountain, Page County, Virginia, is hexaploid. This variety likewise occurs "on the Labrador Peninsula and in Newfoundland and south to the Magdalen Islands and subalpine and alpine regions of Mt. Katahdin, Maine, and the White Mountains, New Hampshire, also on Keweenaw Peninsula, Michigan" (see Baldwin, 1946). Cytological examination of plants from some of these northern stations would be of phyletic interest.

Physocarpus and Neviusia

Sax (1931) reported an *n*-number of 9 for four species of *Physocarpus, P. intermedius* being among the four. This species

is included in the new Gray's Manual as var. *intermedius* of *P. opulifolius;* only *P. opulifolius* and this variety are recognized for the manual range. Sax (1931) recorded for *Neviusia alabamensis* an *n*-number of 8 but later (1932) stated that apparently the correct *n*-number is 9. The 2*n*-number of 18 given in Table I for this monotypic genus corroborates Sax's second report.

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Literature Cited

Baldwin, J. T., Jr. 1946. Spiraea latifolia var. septentrionalis in Virginia. Rhodora **48**: 112.

Bowden, Wray M. 1945. A List of chromosome Numbers in Higher Plants. Amer. Jour. Bot. **32**: 191–201.

Clover, Elzada U. and Lois Jotter. 1941. Cacti of the Canyon of the Colorado River and Tributaries. Bull. Torrey Club **68**: 409–419.

Sax, Karl. 1931. The Origin and Relationships of the Pomoideae. Jour. Arn. Arb. **12**: 3–22.

——— 1932. Chromosome Relationships in the Pomoideae. Jour. Arn. Arb. **13**: 363–367.

——— 1936. Polyploidy and Geographic Distribution in Spiraea. Jour. Arn. Arb. **17**: 352–356.

Willis, J. C. 1948. A Dictionary of the Flowering Plants and Ferns. University Press. Cambridge.

Erroneous record of Borrichia frutescens from District of Columbia.—In the 8th edition of Gray's Manual (p. 1487. 1950) the range of the sea-ox-eye, *Borrichia frutescens* (L.) DC., is given as "borders of saline or brackish marshes, Florida to Texas and Mexico, north to eastern Virginia, and Anacostia River, D. C. July–Oct. (Bermuda)." (The abbreviations in the text here extended.) The species had never previously been reported from the District of Columbia region, and this record of an essentially maritime species so far up the Potomac River system as the Anacostia River was so remarkable as to arouse doubt as to its authenticity. Dr. Reed C. Rollins, to whom I applied for information, wrote me that there was a sheet in the Gray Herbarium labeled as follows: "Marsh along Anacostia River above Benning, District of Columbia, Aug. 28, 1925, *E. T. Wherry & F. W. Pennell 12417.*" This seemed definite enough, but the question still remained how the plant, which is entirely

unknown along the Potomac River or even Chesapeake Bay above its mouth, could have reached the Anacostia River without leaving at least some colonies in the more brackish areas along its route. The marsh above Benning Bridge on the Anacostia River is a typical fresh water marsh (in process of being destroyed by dumps) with no saline or even brackish character. Mr. F. M. Uhler, of the Fish and Wildlife Service of the Interior Department, informs me that in normal seasons the head of brackish water is about at the mouth of Aquia Creek, some 40 miles down the Potomac from Washington (in Stafford County, Virginia), and that while the underrun of saline water may in times of drought reach to Mt. Vernon or perhaps even farther up river, it is in no case sufficiently strong or sufficiently prolonged to influence the distribution of plant life. Correspondence with Dr. Wherry and Dr. Pennell, with an interim visit to the locality itself with James E. Benedict, Jr. (who, and not Wherry, had accompanied Pennell on this occasion, as his diary showed), finally solved the mystery. The entry of the number in question (12417) occurred in Pennell's notebook between the end of one day's collecting and the beginning of the next, on the opposite page from the main entries, and through a preparator's error the labels of this number were given the data of the collection above, which was from Benning Bridge, rather than that of the number below with which it rightly belonged. The specimens were actually collected by Wherry and Pennell in a salt marsh at Newport News, Virginia, on August 29, 1925.

The northernmost known locality for *Borrichia* appears to be Chincoteague Island, Northampton County, Virginia, on the Delmarva Peninsula, where it was collected by Dr. R. R. Tatnall, author of the *Flora of Delaware and the Eastern Shore*, on Sept. 13, 1928, in shallow salt water on edge of marsh on the border of the narrow inlet which separates Chincoteague Island from Assateague Island, just east of Chincoteague Island village. This locality is only five or six miles south of the Maryland line, but the species has never yet been found in Maryland, and Doctor Tatnall is inclined to believe that his locality may mark the extreme northern limit of the species.—S. F. Blake, Division of Plant Exploration and Introduction, Bureau of Plant Industry, Soils, and Agricultural Engineering, Beltsville, Maryland.

Two Color-forms in Eriophorum.—

Eriophorum angustifolium Honck. f. **Scammanianum** Raymond, n. f. *A typo differt setis roseis.* **Alaska.** Nome. Aug. 3, 1949. *Edith Scamman 5350* (Type in the Herbarium of the Montreal Botanical Garden). Since *Eriophorum angustifolium* bears white setae, sometimes blackish in the closely related arctic *E. triste* (Fries) Hadač & Löve (Bot. Not. 1950: 34), this form with pink bristles is striking enough to merit taxonomic recognition. The same may be said of the form described below.

Eriophorum tenellum Nutt. f. **Gorhami** Raymond, n. f. *A typo differt setis subcaeruleis.* Differs from the type by its bluish bristles. **Nova Scotia.** Halifax. Growing in boggy field. Aug. 23, 1945. *E. Gorham 45–1409* (Type in the Herbarium of the Division of Botany and Plant Pathology, Department of Agriculture, Ottawa).

No trace of fungus infection has been found in any of the material upon which the author has based his descriptions. This point is mentioned because the distinctiveness of both varieties is dependent upon the color of the bristles. The author wishes to tender his thanks to Miss Edith Scamman, who has done noteworthy collecting in Alaska, and to Mr. James A. Calder, of the Division of Botany, Department of Agriculture of Canada, who kindly provided him with the specimens described herein. —Marcel Raymond, Montreal Botanical Garden.

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CALLITRICHE IN THE NEW WORLD

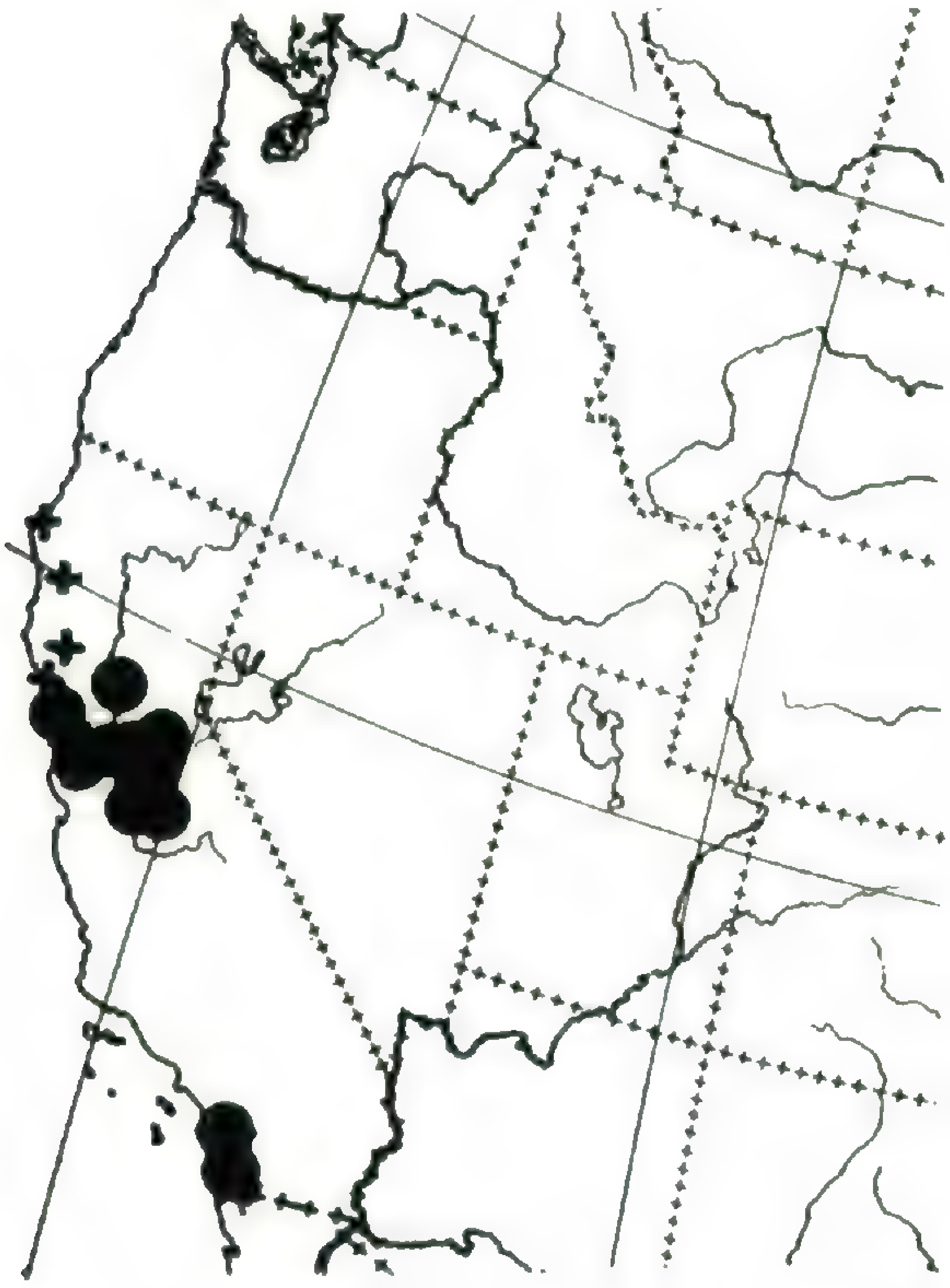
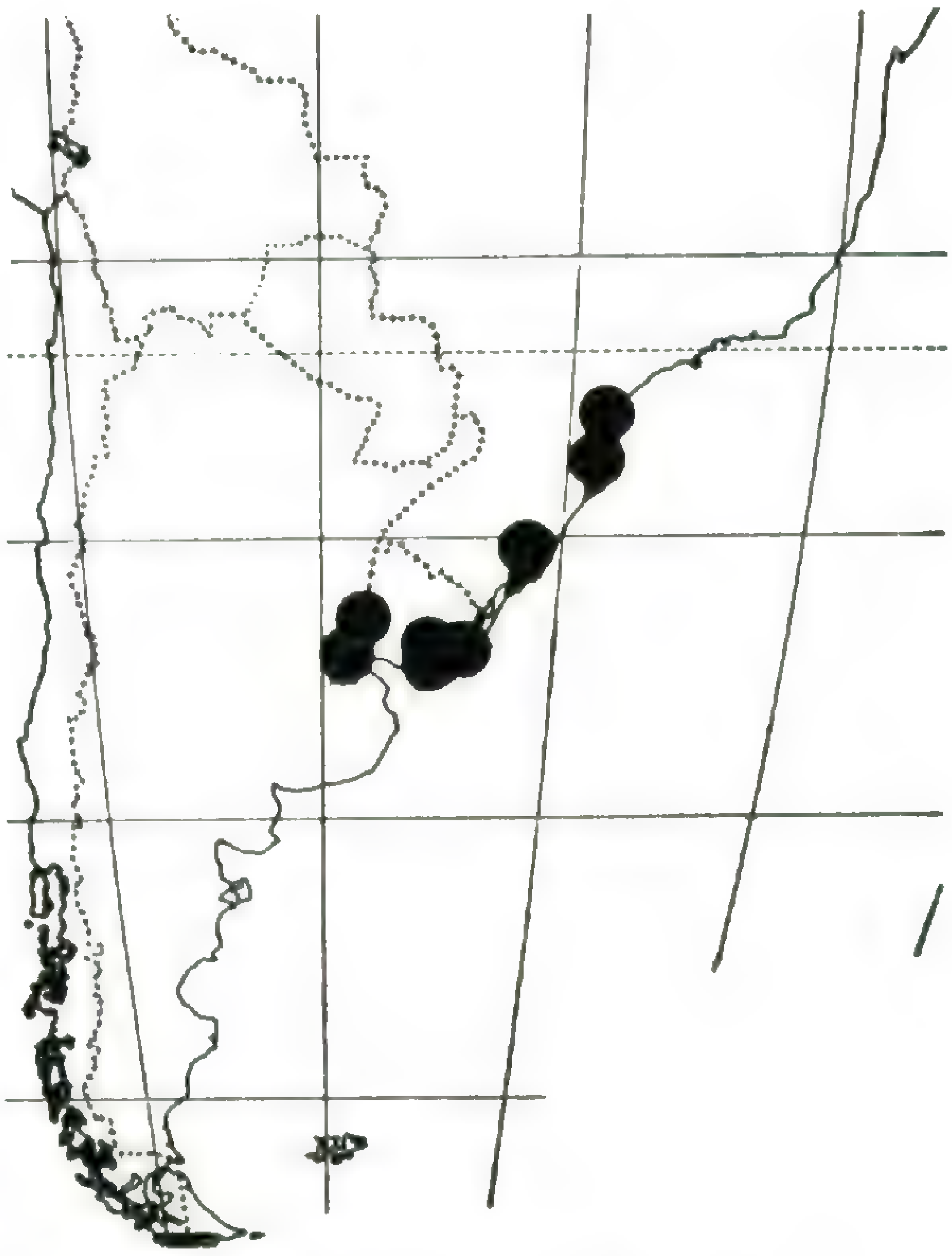
NORMAN C. FASSETT

(Continued from page 194)

21. **C. longipedunculata** Morong, Bull. Torrey Club 18: 236. 1891. Fruit oblong, with nearly parallel or slightly rounded sides, 0.8–1.2 mm. wide. 1.0–1.4 mm. high, the length usually exceeding the width; surface of fruit olive-green when young, nearly black at maturity and shallowly and minutely but distinctly pitted; wing very narrow but of equal width around the whole fruit and slightly entering the lower sinus between mericarps (Fig. 21b), pale; commissural groove very wide and flat-bottomed; pedicel from about 0.5 mm. to 25 mm. in length; bracts present at flowering time but soon caducous; leaves often crowded toward the tips of the branches, less than 1 cm. long, the blade often wider than long and abruptly narrowed to a long margined periole. —Central and southern **California**—Sutter Co.: Marysville, March 21, 1905, *Heller 7561* (NY, MO). Marin Co.: Inverness Ridge, March 1, 1932, *Mason 6801* (UC). Calaveras Co.: three miles above Valley Spring, April 7, 1929, *Mason 5198* (UC); 6 miles south of Keystone on road to La Grange, March 16, 1932, *Hormay 705* (UC); six miles west of Valley Springs, April, 1930, *Mason 5546* (UC); two miles east of Valley Springs, April, 1930, *Mason 5545* (UC). Alameda Co.: Arroyo Mocho, March 6, 1932, *Mason 6807* (UC, GH); Arroyo Mocho, Mount Hamilton Range, alt. 2300 ft., April 14, 1935, *Sharsmith 1729* (UC). San Joaquin Co.: Peters, alt. 100–150 ft., March 20, 1928, *Stanford 835* (GH, US); ten miles east of Stockton, April, 1930, *Mason 5547* (UC). Stanislaus Co.: six miles west of Oakdale, April 7, 1929, *Mason 5171* (UC, GH); Warnerville, March 17, 1936, *Hoover 776* (UC). Merced Co.: four miles north of Merced on Snelling Road, March 16, 1932, *Hormay 706a* (UC, GH); fourteen miles east of Merced on Yosemite Road, Merced River, March 15, 1932, *Hormay 703* (UC, GH); Snelling Road, one and one-half miles north of Merced, March 16, 1932, *Hormay 707* (UC). San Diego Co.: Camp Kearney Mesa, March 2, 1937, *Purer 7106* (MO); mesa north of San Diego, May 10, 1903, *Abrams 3450* (UC, GH, NY, MO); Mesas, San Diego Co., April 25, 1884, *Orcutt* (NY—mixed with *C. marginata*, but TYPE).

The type is cited as "collected in 1884 by C. R. Orcutt, on mesas, San Diego, California." Material bearing these data, at the New York Botanical Garden, is badly mixed; some plants have rotund leaves with peltate scales, floral bracts, and fruits

longer than wide, while others have spatulate leaves lacking scales, no floral bracts, and fruits wider than long. The first kind answers the description of *C. longipedunculata* and may be taken as type of that species, while the second kind is *C. marginata.*

19 (left). *C. trochlearis* (crosses). 21 (left). *C. longipedunculata* (dots). 22 (right). *C. rimosa* (dots).

C. longipedunculata has often been confused with *C. marginata,* with which it has little in common except peduncled fruits. The ecological relationships of these two species have been discussed under *C. marginata.*

Individuals with fruits nearly sessile, or with some of them so, have been treated as *C. stenocarpa* Hegelm. Hegelmaier described the fruit of *C. stenocarpa* as being narrowed toward the base, precisely the character that distinguishes *C. verna* from the plant called *C. stenocarpa* by Morong and by Jepson. Hegelmaier cited two collections by Bolander, each of which consists of a sorry mixture of *C. verna, C. heterophylla* and *C. marginata* (one has also fragments of an aquatic *Ranunculus* for good measure). *C. verna* most closely fits the description of *C. stenocarpa; C. stenocarpa* accordingly becomes a synonym of *C. verna.*

22. **C. rimosa,** n. sp., fructibus rotundis vel angustioribus ad basem, 0.9–1.2 mm. latitudine, 0.9–1.3 mm. altitudine, crassitudine ad basem duplo maiore quam ad apicem; ala manifesta mericarpellorum apicem basemque circumstante; rima faciei fructuum brevi profundaque; commissura in forma V, latissima profundissimaque.—Fruit 0.9–1.2 mm. wide, 0.9–1.3 mm. high, the height and width nearly or quite equal; fruit round or sometimes a little narrowed toward the base; a broad conspicuous wing extending around both upper and lower ends of each mericarp so that the groove on the face of the fruit is short but deep (Fig. 22b); fruit when seen in edge view (Figs. 22c, 22d) about twice as thick at base as at summit, the commissural groove V-shaped, very wide and deep (Fig. 22a); leaves on aquatic forms all of the lanceolate or ovate type, resembling those of Plate 1168, Figs. 2, 4, 5, 8, but sometimes larger and reaching 15 mm. in length and 6 mm. in width; stranded plants forming mats on the mud, with ovate leaves or spatulate leaves like those of Plate 1168, Fig. 1.—Coastal regions from southeastern Brazil to the mouth of Rio de la Plata.—**Brazil:** Parana, Jan. 2, 1904, *Dusen 3040* (US); St. Catharina, June 22, 1885, *Schwacke* (US); Rio Grande do Sul, São Leopoldo, August, 1941, *Leite 2804* (GH) and *614* (NY). **Uruguay:** Castillos, Dep. de Rocha, Nov. 6, 1931, *Herter 941* (CM); Florida, Dec. 22, 1936, *Rosengurtt B 782* (CM); Santiago Vasquez, Dep. de Montevideo, Nov., 1924, *Herter 695a* (TYPE in GH, ISOTYPES in CM, MO, NY, UC, WIS). **Argentina:** Concepcion del Uruguay, Nov. 7, 1877, *Lorentz 851* (CM, GH); Hudson, Prov. Buenos Aires, Oct. 3, 1931, *Parodi 9923* (GH); San Isidro, Prov. Buenos Aires, Oct. 25, 1929, *Parodi 8973* (GH); Bosque de Punta Lara, Prov. Buenos Aires, Nov. 4, 1942, *Dawson 1148* (LP); Ribera del Rio de La Plata, Isla Santiago, Nov. 1, 1932, *Cabrera 2437* (LP); Rio Santiago, cerca de La Plata, prov. de Buenos Aires, Nov. 21, 1929, *Cabrera 918* (LP); Punta Lara, Prov. Buenos Aires, Nov. 11, 1940, *Dawson 993* (LP).

23. **C. stagnalis** Scop. emend. Kütz. *C. stagnalis* Scop. Fl. Carn. ed. 2; 251. 1772, *nomen ambiguum;* Kütz. in Reichenb. Pl. Crit. IX. 36–38, figs. 1184–1186. 1831; Reichenb. Icon. V. Tab. cxxix. fig. 4747. 1841; Hegelm. Monographie Gattung Callitriche 58. 1864; Hegelm. Verhandl. Bot. Ver. Brandenburg. 9: 26. 1867; Glück, Biol. und Morphol. Untersuch. ü. Wasser- und Sumpfgewächse 4: 260. 1924; Samuelsson, Fest. Carl Schröter 613. 1925; Hegi, Ill. Fl. Mitt.-Eur. 5, pt. 1: 196. 1924; Pearsall, Bot. Soc. & Exch. Club Br. Isles 10: 864. 1935; Glück, Süsswasser-Flora Mitteleuropas 15: 293. 1936; Fassett, Manual Aquatic Plants 241. 1940; Muenscher, Aquatic Pl. U. S. 260. 1944; Fernald in Gray's Manual, ed. 8: 973. 1950.—Fruit round or nearly so, 1.2–1.7 mm. wide and nearly or quite as high, the faces flat, shallowly pitted, light brown or very pale,[1] winged evenly all around; wing very narrow on young fruits (Figs. 23a, 23d), about as wide as 3 of the pits at maturity and sometimes erose (Fig. 23h), commonly running around the base and frequently around the summit of each mericarp so that the facial groove is short and deep (Fig. 23o); mericarp semicircular, with inner edge straight (Figs. 23a, 23d) or semilunar with the inner edge curved (Figs. 23c, 23h); styles 2–3.5 mm. long, on the mature fruit often breaking, or persistent and erect, or somewhat deflexed from the summit of the carpels (Fig. 23c) but not from between the mericarps (cf. Fig. 24g); commissural groove somewhat rounded, very wide and deep (Figs. 23f, 23g); foliage very variable.—Europe, and in North America from the St. Lawrence to the Potomac River, in northern Wisconsin, and in Washington and Oregon.

[1] When a mericarp is boiled in KOH and the pericarp stripped off and examined with a compound microscope, the reticulations appear almost colorless rather than dark brown as in other species.

This is almost certainly introduced into eastern North America. The first mention of its occurrence on this continent was in 1932,[1] unless the listing of *C. platycarpa* in Gray's Manual, 1848, with its reference to a large wing-margined fruit, may have been based on this species. The earliest collection in the eastern states appears to have been from New Jersey in 1891. It is at present very abundant in streams and springs in Lancaster Co., Pennsylvania, where it certainly would have been collected long ago if it were native.

From the far Northwest there is a collection from Oregon, without locality, made by Elihu Hall in 1871. This leads to speculation on the possibility of its being native in that region.

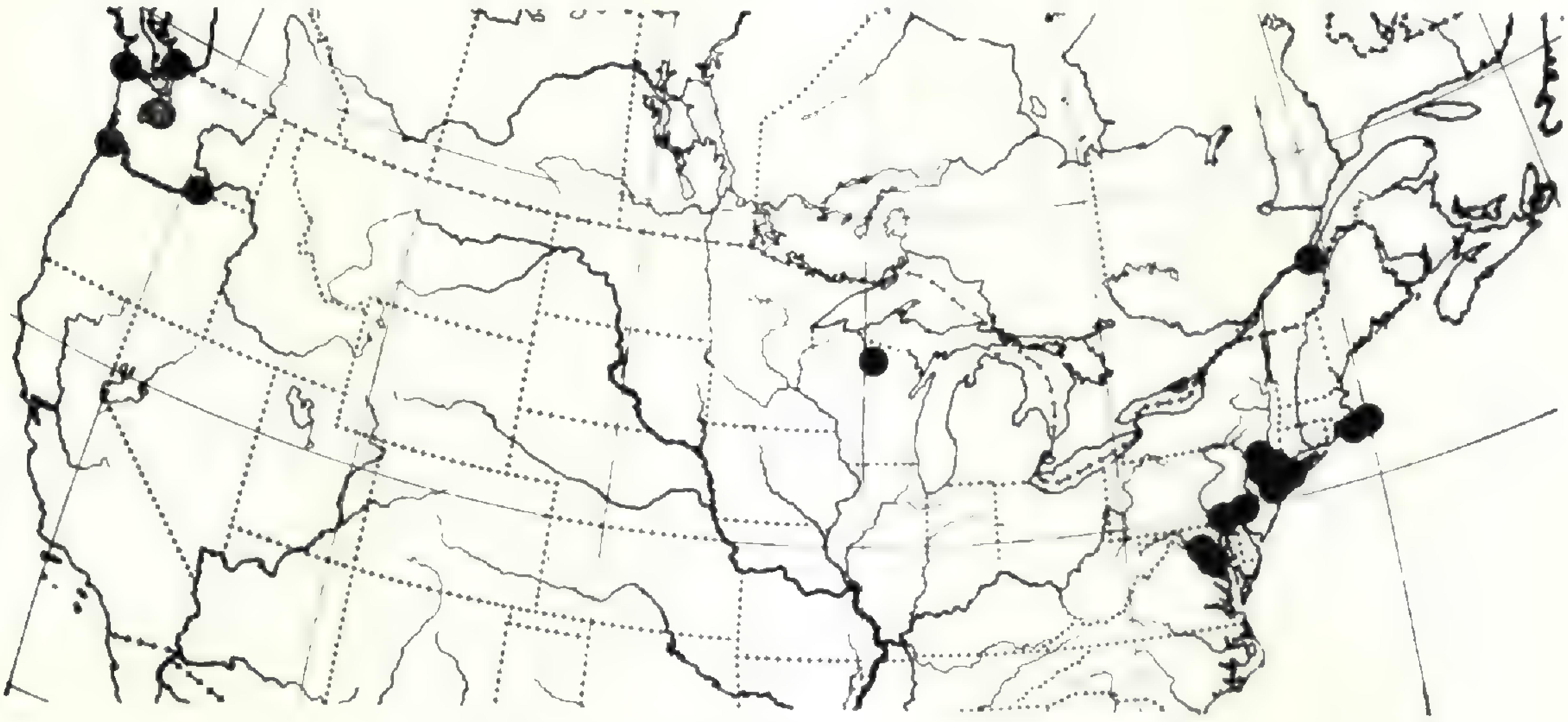
North American material is perhaps a little less variable than the European; this may signify that the forms are in part genetic in origin as well as ecological, and that only certain strains have been introduced. The commonest phase of the species is the typical robust aquatic, *C. stagnalis* f. *stagnalis*. Of the material examined by the present writer, about 50% of the European specimens are f. *stagnalis*, and 80% of the American specimens are this form. The writer has examined *C. stagnalis* in the vicinity of Ephrata, Lancaster Co., Pennsylvania, where it remains essentially uniform as f. *stagnalis* in a variety of aquatic habitats. In the shallow polluted water of Cocalico Creek directly below the Ephrata sewage plant, *C. stagnalis* is somewhat less luxuriant than in the pure cold springs at nearby Springville, but the plants themselves are quite similar in appearance. On the other hand, a single clone along the shore line may form a dense turf on the mud with stems partly creeping and partly erect to a height of nearly 10 cm. with leaves 3–4 mm. long, while as it extends into the water the stems elongate and have submersed and floating leaves twice the size of the terrestrial ones; such a plant is cited below under f. *caespitosa*.

The named variations in habit and leaf form are legion. The following key is derived in large part from the descriptions by Glück, 1924. No particular effort has been made to correlate all the names and determine strict priority. The forms are probably of ecological origin in large part, and are recognized here only to show something of the range of variation. Actually, a

[1] Svenson, Rhodora 34: 37–39. 1932, and Fernald, ibid. 39.

somewhat similar organization of ecological forms might be proposed for nearly or quite every species in the Sect. Callitriche.

a. Aquatic forms.
  b. All leaves 3–7-nerved.
    c. Leaves obovate.......................................f. *stagnalis.*
    c. Leaves spatulate.....................................f. *spathulata.*
  b. Some leaves linear and 1-nerved.
    d. Broad leaves also present in a floating rosette.........f. *heterophylla.*
    d. Broad leaves absent.................................f. *submersa.*



23. *C. stagnalis* in the New World.

a. Terrestrial forms, rooting at most of the nodes and forming a close turf, but with tips of stems often erect.
  e. Internodes very short; leaves 0.5–2.5 mm. wide............f. *terrestris.*
  e. Internodes about 1 cm. long; leaves 2–5 mm. side.........f. *caespitosa.*

C. stagnalis f. **stagnalis.** *C. stagnalis* f. *vulgaris* (Kütz) Glück, Biol. und Morphol. Untersuch. ü. Wasser- und Sumpfgewächse 4: 265. 1924. *C. stagnalis α vulgaris* Kütz. in Reichenb. Pl. Crit. IX. fig. 1184–86. 1831.—**Massachusetts:** Waquoit, Barnstable Co., Aug. 2, 1911, *Pennell 3381* (GH); Falmouth, Barnstable Co., Oct. 28, 1928, *Fernald & Svenson 466* (GH, NY, MO, UC, US, WIS, US, CM). **New York:** Cold Spring Harbor, Long Island, 1919, *Banker 2962* (NY); Valley Stream, Long Island, April 5, 1931, *Svenson 4451* (GH); Islip, Long Island, April 5, 1931, *Svenson 4552* (GH); Richmond, Staten Island, June 7, 1931, *Svenson 4493* (GH); Constitution Island, Putnam Co., Aug. 23, 1936, *Muenscher & Curtis 5745* (GH); Vails Gate, Orange Co., June 14, 1938, *House 25672* (GH, NY). **New Jersey:** Carlton Hill, Bergen Co., July 11, 1891, *Nash* (NY); Preakness, Passaic Cr., May 31, 1931, *Svenson 4478* (GH). **Pennsylvania:** Indian River, West Philadelphia, May 17, 1923, *Meredith* (GH); West Philadelphia, Nov. 24, 1929, *Svenson 3486* (GH); Landsdowne, Delaware Co., June 27, 1932, *Hermann 3325* (US); Germantown, Philadelphia Co., May 13, 1936, *Fogg 10294* (GH); Ephrata, Lancaster Co., July 19, 1948, *Fassett 27856* (WIS); Springville, near Ephrata, Aug. 22, 1948, *Blum* (WIS). **Maryland:** Branchville, Prince Georges Co., May 7, 1927, *Uhler* (WIS); National Agric. Research Area, Beltsville, April 14, 1941, *Jensen* (WIS);

Beltsville, Prince Georges Co., June 10, 1943, *Hermann 10827* (NY); Beltsville, May 31, 1946, *Hotchkiss 7073* (US); Plummers Island, Cabin John, June 7, 1947, *Killip 36833* (US); Lock 11, C. & O. Canal, Montgomery Co., May 16, 1942, *Killip 36567* (GH, MO, US). **Wisconsin:** Rhinelander, Oneida Co., Aug. 25, 1925, *Davis* (WIS). **Washington:** Kennewick, Benton Co., Aug. 1926, *Jones 369* (WIS). **Oregon:** without locality, 1871, *Elihu Hall 460* (CM); John Day, Clatsop Co., Aug. 10, 1902, *Sheldon 11215* (GH, NY, MO, US, CM). **British Columbia:** New Westminster, June 10, 1916, *Henry 9068* (GH).

This form includes the most luxuriantly growing plants and largest foliage in the species, and probably in the entire genus *Callitriche*. Some leaves reach 8 mm. in width and 2.5 cm. in length.

C. stagnalis f. **heterophylla** Glück, l. c. **Massachusetts:** Falmouth, Barnstable Co., Oct. 28, 1928, *Fernald & Svenson 953* (GH).

C. stagnalis f. **terrestris** Glück, l. c., 266. *C. stagnalis* var. *serpyllifolia* Lönnr. Obs. Crit. Pl. Suec. 16. 1854. **Quebec:** Anse St. Vallier, Bellechasse Co., Sept. 15, 1931, *Fernald 2530* (GH, US).

C. stagnalis f. **caespitosa** Glück, l. c., 268. **Massachusetts:** Falmouth, Barnstable Co., Oct. 28, 1928, *Fernald & Svenson 954* (GH, NY, NEBC). **Pennsylvania:** West Philadelphia, Nov. 24, 1929, *Svenson 3486* (MO—mixed with f. *stagnalis*); Ephrata, Lancaster Co., July 19, 1948, *Fassett 27853* (WIS—this is the terrestrial portion of the plant; the aquatic portion is f. *stagnalis*). **Maryland:** mouth of the Sligo, May 17, 1915, *Standley 11584* (US). **Washington:** Green Lake, Seattle, July 28, 1933, *Thompson 9612* (NY). **British Colombia:** New Westminster, June 10, 1916, *Henry 9069* (GH—same locality as *Henry 9068* which is f. *stagnalis*).

PLATE 1175

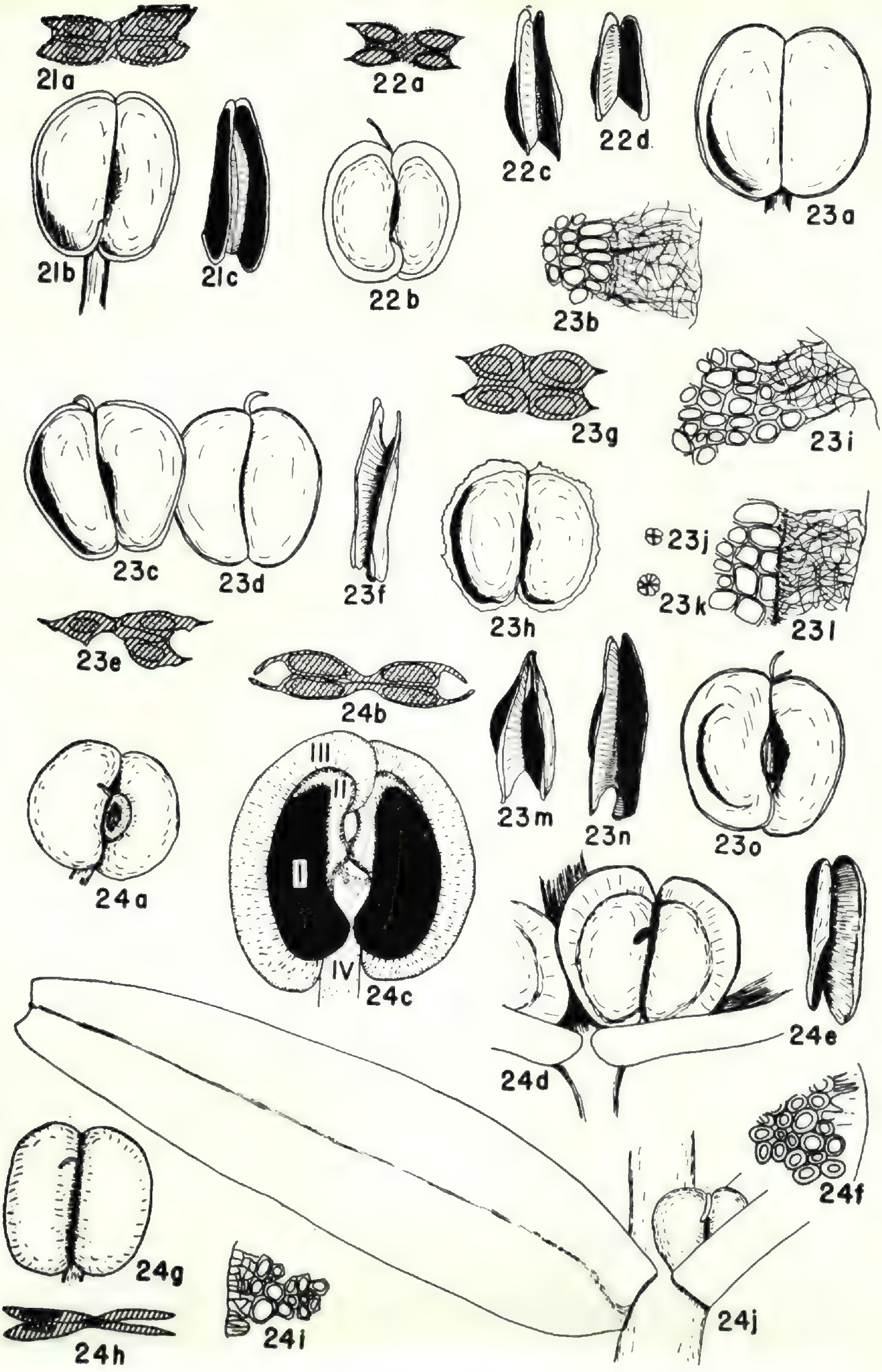
(Numbers same as in keys and descriptions)

21. *C. longipedunculata.* 21a. Cross-section of fruit, × 30. California, *Stanford 835* (US). 21b. Face of fruit, × 30. Same collection. 21c. Edge of fruit, × 30. Same collection.

22. *C. rimosa.* 22a. Cross-section of fruit, × 30. Uruguay, *Herter 695a* (GH). 22b. Face of fruit, × 30. Same collection. 22c. Edge view of fruit, × 30. Argentina, *Parodi 9561* (GH).

23. *C. stagnalis.* 23a. Face of young fruit, × 30. Pennsylvania, *Meredith* (GH). 23b. Portion of wing and face of fruit, × 187.5. Same collection. 23c. Face of fruit, × 30. France, *Cintract* in 1885 (US). 23d. Face of fruit, × 30. Same collection. 23e. Cross-section of fruit, × 30. Same collection. 23f. Edge view of fruit, × 30. Same collection. 23g. Cross-section of fruit, × 30. Massachusetts, *Fernald & Svenson 952* (GH). 23h. Face of fruit, × 30. Same collection. 23i. Portion of wing and face of fruit, × 187.5. Same collection. 23j. Peltate scale from leaf, × 187.5. Pennsylvania, *Blum* (WIS). 23k. Peltate scale from leaf, × 187.5. Same collection. 23l. Portion of wing and face of fruit, × 30. Same collection. 23m. Edge view of fruit, × 30. Massachusetts, *Fernald & Svenson 952* (GH). 23n. Edge view of fruit, × 30. Pennsylvania, *Blum* (WIS). 23o. Face of fruit, × 30. Same collection.

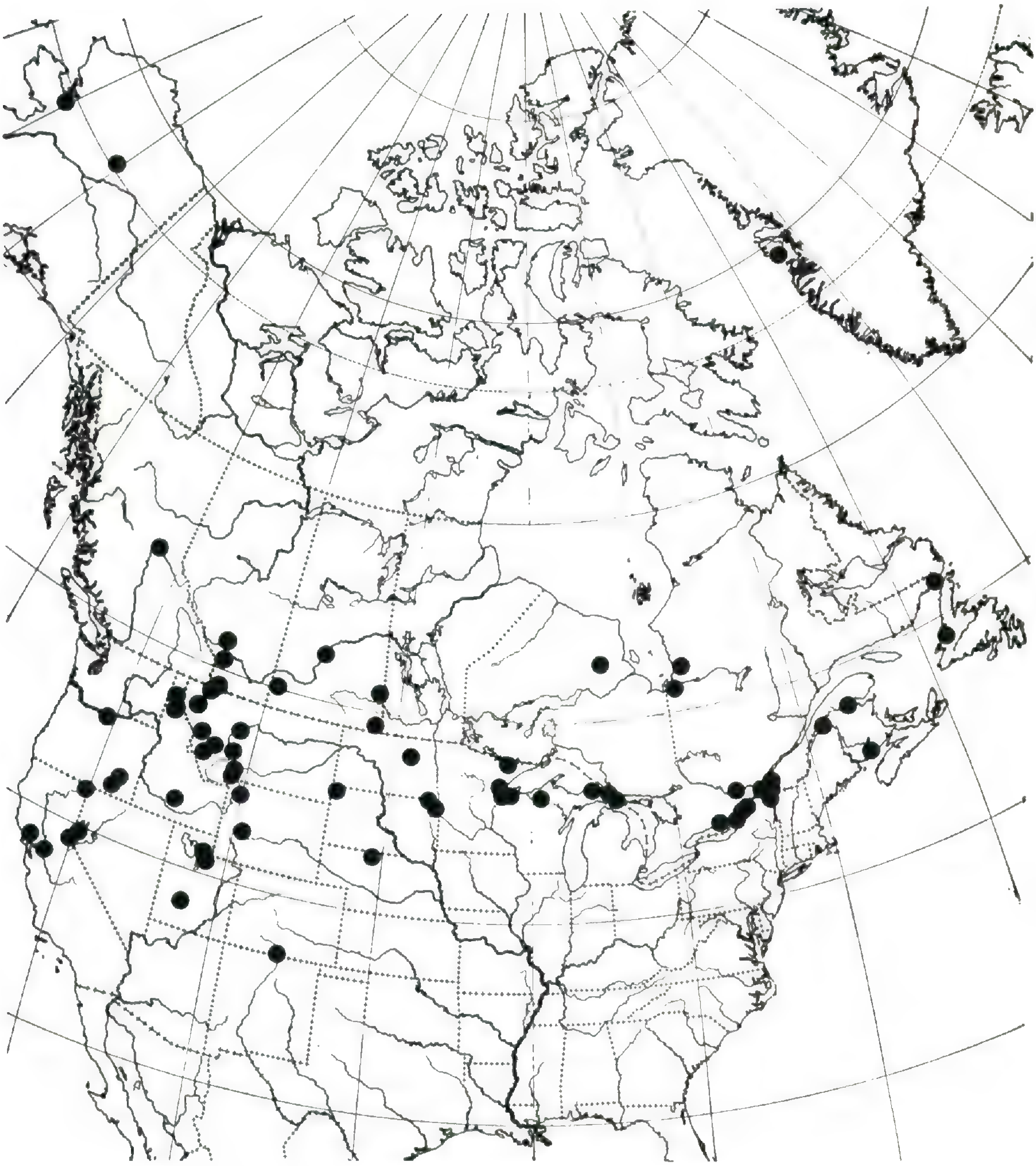
24. *C. hermaphroditica.* 24a. Face of young fruit, with an aborted mericarp, × 30. Wyoming, *Payson & Payson 2933* (NY). 24b. Cross-section of fruit, × 30. Greenland, *Porsild* (US). 24c. Face of fruit, from boiled specimen, showing seeds (I), partly surrounded by inflated part of mericarps (II), false wing formed by uninflated parts of mericarps (III), and pedicel (IV), × 30. Same collection. 24d. Face of fruit, parts of stem and leaves, × 30. New York, *Fernald, Wiegand & Eames 14371* (GH). 24e. Edge view of fruit, × 30. Same collection. 24f. Portion of wing and face of fruit, × 187.5. Same collection. 24g. Face of young fruit, × 30. Nebraska, *Kiener 23769* (WIS). 24h. Cross-section of young fruit, × 30. Same collection. 24i. Portion of wing and face of fruit, × 187.5. Same collection. 24j. Leaf, young fruit and part of stem, × 30. Quebec, *Victorin & Rolland 29082* (GH).



Callitriche. 21. C. longipelunculata. 22. C. rimosa. 23. C. stagnalis. 24. C. hermaphroditica.

C. stagnalis f. *submersa* Glück, l. c., 260, and f. *spathulata* Glück, l. c., 264, have not been seen from the Western Hemisphere.

24. **C. hermaphroditica** L. Cent. I. Pl. no. 90. Feb. 1755; Schinz & Thellung, Vierteljahrs. Nat. Gesell. Zurich 53: 548. 1909; Fernald & Wiegand, Rhodora 25: 211. 1923; Victorin, Fl. Laurent. 217. 1935; Fassett, Man. Aquat. Pl. 241. 1940; Muenscher, Aquat. Pl. U. S. 260. 1944; Fernald in Gray's Manual, ed. 8. 973. 1950. *C. palustris* var. *bifida* L. Sp. Pl. 2. 969. 1753 (perhaps). *C. autumnalis* L. Fl. Suec. ed. 2: 2. Oct. 1755; Willd. Sp. Pl. ed. 4, 1: 29. 1798; Wahlenb. Fl. Lap. 2. 1812; DC. Prod. 3: 71. 1828; Hegelm. Monogr. Gattung Callitriche 61. 1864; Hegelm. Verhandl. Bot. Brandenburg 9: 35. 1867; Robinson & Fernald in Gray's Man. ed. 7: 550. 1908; Henry, Fl. South. B. C. 200. 1915; Rydb. Fl. Rocky Mts. 548. 1917; Rydb. Fl. Prairies & Plains 522. 1932; Samuelsson, Festschrift Carl Schröter 610. 1925; Jepson, Fl. Calif. 2: 435. 1936; Peck, Man. Higher Pl. Ore. 466. 1941. *C. bifida* Morong, Mem. Torrey Club 5: 215. 1894; Britton & Brown, Ill. Fl. ed. 1, 2: 382. 1897; Coult. & Nels. Man. Rocky Mt. Bot. 312. 1909.—Fruit from 1–2.5 mm. wide, about as high as wide; surface of carpels obscurely and irregularly pitted; margins of carpels with a narrow wing (Fig. 24d), but the outer part of the carpel itself strongly compressed and wing-like (Fig. 24b); style sharply reflexed from between the mericarps (Figs. 24a, 24d, 24g, 24j), usually breaking and leaving the persistent base; floral bracts absent; leaves lance-linear, uniform (Fig. 24j), metallic green, narrowly white-margined, with bases distant or nearly in contact but not connected by a wing.—Europe; Greenland to Alaska, south to New Brunswick, Quebec, northern Vermont, northern New York and adjacent Ontario, Upper Peninsula of Michigan, northern Wisconsin, Minnesota and South Dakota, and in the mountains to Colorado, Utah, Nevada and California; of local occurrence eastward.—Relatively few of the many collections examined are cited below. **Greenland:** lakes at Kamavit, Nordfjord, Disco, Aug. 7, 1902, *Porsild* (US, GH); S. Disco, Godhavn, 69° 15′ Lat. bor., Sept. 11, 1923, *Porsild* (US, GH, NY). **Labrador:** Blanc Sablon River, Straits of Belle Isle, Sept. 3, 1925, *Fernald, Wiegand & Long 28644* (GH). **Newfoundland:** Dead Lake, Bay of Islands, Aug. 25, 1897, *Waghorne* (MO, GH); East Brook, St. Barbe Bay, Aug. 29, 1925, *Wiegand & Hotchkiss 28643* (GH). **Quebec:** East Main River, east coast of Hudson Bay, 52° 15′ N., Aug. 29, 1944, *Dutilly & Lepage 13508* (WIS, GH); Broadback River, Rupert Bay, James Bay, 51° N., 79° W., Sept. 4, 1946, *Dutilly & Lepage 16972* (WIS); Lake Temiscouata, Aug. 28, 1891, *M[acoun]* (NY); Hull, Sept. 8, 1917, *Rolland 6198* (US, MO, GH, NY); Longueuil, île Plate, Aug. 25, 1927, *Victorin & Rolland 29082* (US, GH); Isle-aux-Noix, Richelieu River, Aug. 13, 1918, *Victorin 8165* (US, GH). **New Brunswick:** tidal shores Restigouche River, Tide Head, Restigouche Co., Aug. 16, 1923, *Svenson & Fassett 2014* (GH); Rothsay, Aug. 4, 1877, *Fowler* (GH). **Vermont:** Kelleys Bay, Lake Champlain, Aug. 5, 1878, *Pringle* (GH, MO, CM, NY). **New York:** Ogdensburg, *Clinton* (GH); Alexandria Bay, Sept., 1863, *Clinton* (NY); Morristown, Aug. 15, 1914, *Phelps 703* (US, GH, NY); Waddington, St. Lawrence Co., Aug. 22, 1935, *House 22964* (GH, US, NY); Showshoe Bay, Jefferson Co., Aug. 31, 1931, *Muenscher & Maguire 2378* (MO, GH, UC); Guffin Bay, Point Salubrious, Jefferson Co., Aug. 27, 1922, *Fernald, Wiegand & Eames 14371* (GH). **Ontario:** Battersea, Aug. 30 or 31, 1904, *Fowler* (MO, US). **Michigan:** Sault Ste. Marie, Aug. 25, 1882,



24. *C. hermaphroditica* in the New World.

Morong (NY, CM, GH); Pt. Detour, Sept. 21, 1875, *Gillman* (NY, MO); Tahquamanon River, Luce Co., Sept. 10, 1915, *Dodge 192* (NY); West Branch of Ontonagan River near Tenderfoot Lake, Gogebic Co., Aug. 27, 1931, *Hotchkiss & Koehler 4344* (US). **Wisconsin:** Marengo Lake, Bayfield Co., Sept., 1931, *Hotchkiss & Koehler 4359* (US, UC); Bark Bay, Bayfield Co., Aug. 10, 1945, *Thomson & Bjork* (WIS); Brule, Douglas Co., Sept. 14, 1942, *Fassett 21990* (WIS, GH). **Minnesota:** Fall Lake, Lake Co., Sept., 1921, *Kubichek 169* (US); Lake Comstock, 34 miles north of Duluth, Aug. 16, 1938, *Lakela 2729* (GH); Wheaton, Traverse Co., Sept., 1893, *Sheldon* (GH, US, WIS). **North**

Dakota: Leeds, Benson Co., July 27, 1911, *Lunell* (US). **South Dakota:** Buffalo Lake, Marshall Co., Aug. 3, 1923, *Over 15463* (US); Dry House Creek, Harding Co., July 26, 1910, *Visher 143* (CM). **Nebraska:** fish hatchery pond, Valentine, Cherry Co., June 1, 1948, *Kiener 23769*—possibly introduced (WIS). **Saskatchewan:** Yorkton, July 7, 1906, *Macoun 72366* (NY, CM); Crane Lake, June 20, 1894, *Macoun 4962* (GH); Souris River, July 29, 1883, *Macoun* (US). **Alberta:** Cree (Mamawi) Creek, about 58° 29′ N. to 58° 34′ N., 110° 30° W., Wood Buffalo Park, Mackenzie Basin, Aug. 15, 1930, *Raup 2812* (GH, NY, UC); 13 miles south of Calgary, July 31, 1941, *Hitchcock & Martin 7832* (GH, MO, NY, UC). **Montana:** Townsend, July 15, 1895, *Shear 5252* (US, NY); Great Falls, Oct. 5, 1888, *Williams 772* (US); Georgetown Lake, Anaconda, Sept. 15, 1922, *Sperry 325* (US); Lake McDermott, Glacier National Park, Aug. 10, 1919, *Standley 17429* (US). **Wyoming:** Yellowstone Lake, Sept., 1885, *Tweedy* (US); Kendall, Sublette Co., Aug. 5, 1922, *Payson & Payson 2933* (GH, US, NY, UC, MO). **Colorado:** Rio Grande at Loma (probably Costilla Co.), 1873, *Wolf 987* (CM, US); Cottonwood Lakes, 8000 ft., Aug., 1886, *Harper* (CM). **Idaho:** Thompson Mountain, Coeur d'Alene Mountains, Aug. 27, 1895, *Leiberg 1604* (GH, US, MO); Camas Cr., Camas Co., *Davis 2806* (WIS). **Utah:** Big Cottonwood Canyon, Salt Lake Co., Aug. 21, 1905, *Garrett 1626* (NY); Brighton's, Sept., 1898, *Jones 6356* (MO, US). **Nevada:** Coon Creek Pass, Jarbridge Mountains, Elko Co., Aug. 10, 1943, *Maguire & Holmgren 22412* (GH, US, NY, UC); Copper Basin, Humboldt National Forest, Elko Co., Aug. 23, 1941, *Holmgren 1883* (NY, UC); Reno, Washoe Co., July 4, 1937, *Archer 5506* (NY). **Alaska:** Amchetka I., Unalaska, April 17, 1937, *Steenis 4643* (WIS); Seward Peninsula, Buckland River 26 miles above the delta, Sept. 7–10, 1926, *Porsild & Porsild 1598* (GH, US); Wiseman, Aug. 1–9, 1940, *Scamman 2276* (GH). **British Columbia:** Bonaparte River, June 23, 1889, *Macoun 8821* (CM); Prince George, July 31, 1941, *Weber 2583* (NY). **Oregon:** Dalles City, May 4, 1898, *Suksdorf 2746* (GH, MO, CM, US); Harney Valley, June 10, 1885, *Howell* (US, CM). **California:** Clementes, San Joaquin Co., May 3, 1928, *Mason 4445* (UC—TYPE of var. *bicarpellaris* Fenley, GH); Mt. Reservoir, Devil's Garden, Modoc Co., Aug. 22, 1935, *Wheeler 3904* (NY, GH); Kelseyville, May 13, 1929, *Blankinship* (MO). A sheet labelled Mobile, Alabama, March, 1888, *Mohr* (US) is certainly mislabelled.

The three Linnean names have been somewhat doubtful in application, because submersed individuals of the Callitriche group sometimes lack expanded leaves and may well have been confused with this species. According to Samuelsson, l. c., the plants of Loeselius and of von Haller, on which the name *C. palustris* var. *bifida* was based, and which are cited under *C. hermaphroditica* and under *C. autumnalis*, are both of the Callitriche group. Samuelsson therefore treated the three Linnean names as confused names, and took up *C. autumnalis* as emended by Wahlenberg, who gave what he considered to be the first unequivocal description. Unfortunately, Wahlenberg took up the more recent of the two specific names used by Linnaeus. It may be argued, then, that his interpretation of *C. autumnalis* L.

(Oct., 1755) served automatically as an interpretation of *C. hermaphroditica* L. (Feb., 1755), and validates the older name as well as the younger, since *C. autumnalis* and *C. hermaphroditica* are based on exactly the same references and so are synonymous. Certainly, *C. autumnalis* was a superfluous name when published, being a direct renaming of *C. hermaphroditica.*

But the assumption that both specific names were based on submersed forms of the Callitriche group is not wholly justified. To be sure, the treatment in the Species Plantarum was based on ecological forms alone. But in 1755 Linnaeus' student Juslenius described *C. hermaphroditica*, excluding *C. palustris* of the Species Plantarum and specifying "autumno florens." Later in the same year Linnaeus took the hint from his student and differentiated *C. verna* ("*Majo & junio*") and *C. autumnalis* ("*Autumno florens*"). Apparently he substituted the name *autumnalis* for *hermaphroditica* in an attempt to emphasize the seasonal difference between what we now take as the Sect. Callitriche and the Sect. Pseudocallitriche. *C. verna* could have been any one of a number of species, but *C. autumnalis* and *C. hermaphroditica* could have been only the late-flowering species now known by these names.

For many years after 1755 Linnaeus' name *C. autumnalis* was used, to the exclusion of the earlier *C. hermaphroditica* proposed by his student. In 1909 Schinz & Thellung pointed out that the longer epithet had priority. Rather than starting as a completely ambiguous name, *C. autumnalis* has acquired ambiguity during the intervening years, having been applied to various species by different authors (cf. Pearsall, Bot. Soc. & Exch. Club Br. Isles 10: 867. 1935). *C. hermaphroditica*, on the other hand, has been spared such misapplications, chiefly due to the fact that it has scarcely appeared in the literature from the time Linnaeus suppressed it in favor of *C. autumnalis* to its revival in 1909.

At first examination there would appear to be two types of fruit on this species. One is broad-winged and plump-sided (Fig. 24d), ranging from 1.2–2.5 mm. in width, while the other is nearly wingless and flat-sided (Fig. 24g), ranging from 1.0–1.5 mm. in width. These two types, however, are but two stages in development; the first is found on collections from early June to early September, while the latter is collected from August to

December (May, in California). Fig. 24g, then, which can scarcely be distinguished from the fruit of *C. hamulata*, is but an early stage in development. Large and fully matured fruits, on the other hand, are often quite similar to those of *C. stagnalis*, differing most conspicuously in their recurved styles.

The broad wing represented in Fig. 24b seems to be formed of the walls of the carpel rather than from an outgrowth of the epidermis. This is best shown in the face view (Fig. 24c); here the black represents the seeds, on the inner and upper sides of which appear the inflated empty portions of the carpels, then the broad marginal part of the carpel looking like a very wide wing. The reticulations of the carpel wall (not shown in the drawing) extend completely to the edges of the fruit. The fruit pictured in face view (Fig. 24c) was boiled before being drawn, while the one used for the cross-section (Fig. 24b) was not, which may explain the absence of the inflated portion in the cross-section.

While there is some tendency toward abortion of one or two mericarps in nearly all species, the tendency seems stronger in this species. A young fruit with one aborted mericarp is shown in Fig. 24a. *C. autumnalis* var. *bicarpellaris* Fenley in Jepson, Fl. Calif. 2: 436. 1936, appears to be based on one of the not uncommon individuals with two mericarps aborted.

KEYS FOR IDENTIFICATION IN LIMITED AREAS

Callitriche in the Gray's Manual Area

a. Plants of various habit and leaf form (Plate 1168); leaf bases connected by a narrow membranous wing (Figs. 1a, 10g, 10w).
  b. Fruit 0.6–1.0 mm. wide; carpels wingless (Fig. 13a) or with wing at summit and narrowed or absent down the sides (Figs. 10a, 10d).
    c. Plants terrestrial, with essentially uniform broadly oblanceolate leaves (Fig. 3a); width of fruit exceeding the height by 0.2 mm. (Fig. 3b); anthers 0.1–0.2 mm. wide; stigmas 0.2–0.4 mm. long. . . . . *C. terrestris.*
    c. Plants aquatic or subterrestrial, of diverse habit and foliage; width of fruit less than, or equalling, or barely exceeding the height; anthers 0.3–1.5 mm. wide; stigmas 0.7 mm. or more long.
      d. Height of fruit exceeding the width by 0.1 mm. or less, or not at all; carpels wingless or with an obscure false wing (Figs. 4 & 5 on Plate 1167); reticulation on mericarps not running in vertical lines (Fig. 9 on Plate 1167).
        e. Foliage relatively coarse (Plate 1168); fruit widest above the middle (Figs. 13a, 13d, 13e, 13w); linear

submersed leaves with tip of vein scarcely excurrent (Figs. 13h, 13s, 13An, 13Ao) . . . . *C. heterophylla.*
e. Foliage delicate (Figs. 1–9 on Plate 1169); fruit of equal width above and below the middle (Figs. 16b, 16f); linear submersed leaves with tip of vein slightly excurrent (Fig. 16e) . . . . *C. anceps.*
d. Height of fruit exceeding the width by 0.2 mm. (Plate 1172); carpels with a wing at summit that narrows and usually disappears down the sides (Figs. 1 & 2 on Plate 1167); reticulation on mericarps tending to run in vertical lines (Figs. 1 & 2 on Plate 1167) . . . . *C. verna.*
b. Fruit 1.2–1.7 mm. wide; wing equally broad all around the carpel (Figs. 23c, 23h) . . . . *C. stagnalis.*
a. Plants all aquatic with uniform linear-lanceolate leaves with bases not connected by a wing . . . . *C. hermaphroditica.*

Callitriche in the Rocky Mountain and Pacific States

a. Plants of various habit and leaf form (Plate 1168); leaf bases connected by a narrow wing (Figs. 4a, 10g, 10w).
b. Fruits pedicelled.
c. Fruit wider than high.
d. Leaves spatulate, the upper 0.8–2 mm. wide, 3-nerved (Fig. 4a); wing of carpels 0.1–0.2 mm. wide . . . . . . *C. marginata.*
d. Leaves linear, 0.6 mm. or less wide, 1-nerved or with nearly obsolete lateral veins (Fig. 5a); wing of fruit nearly obsolete (Fig. 5a) . . . . *C. sepulta.*
c. Fruit higher than wide (Fig. 21b) . . . . *C. longipedunculata.*
b. Fruit sessile or nearly so.
e. Carpels broadly winged all around the margin.
f. Fruit about as wide as high.
g. Fruit 1.0–1.2 mm. wide, at maturity nearly black, with sharply reticulate surface and white well-differentiated wings; groove between carpels shallow (Figs. 19a, 19b) . . . . *C. trochlearis.*
g. Fruit 1.2–1.7 mm. wide, at maturity nearly white, with obscurely reticulate surface grading almost imperceptibly into the wing; groove between carpels wide and deep (Figs. 23f, 23g) . . . . *C. stagnalis.*
f. Fruit higher than wide . . . . *C. longipedunculata.*
e. Carpels wingless or winged at summit with the wing decreasing in width or absent on the sides.
h. Length of fruit exceeding width by 0.2 mm. (Plate 1172); carpels winged at summit, the wing decreasing in width down the sides (Fig. 1 on Plate 1167); reticulations on mericarps tending to run in vertical rows (Figs. 1 & 2 on Plate 1167) . . . . *C. verna.*
h. Length of fruit almost equalling or slightly exceeding the width (Figs. 13a, 13d, 13Aa); carpels wingless or with an obscure false wing (Fig. 4 on Plate 1167); reticulations on mericarps not in vertical rows (Figs. 4, 5, 7, 8, 9 on Plate 1167).
i. Foliage coarse (Plate 1168); fruit widest above the middle (Figs. 13a, 13Aa); linear submersed leaves with tip of vein scarcely excurrent (Figs. 13h, 13s, 13An, 13Ao).
j. Fruit 0.7–0.8 mm. wide . . . . *C. heterophylla* var. *heterophylla.*
j. Fruit 0.9–1.2 mm. wide . . . . *C. heterophylla* var. *Bolanderi.*

i. Foliage delicate (Figs. 1–9 on Plate 1169); fruit of equal width above and below the middle (Figs. 16b, 16f); linear submersed leaves with tip of vein slightly excurrent (Fig. 16e) . . . . *C. anceps.*

a. Plants all aquatic with uniform linear-lanceolate leaves (Fig. 24j); leaf bases not connected by a wing . . . . *C. hermaphroditica.*

Callitriche in the Southeastern United States

a. Plants terrestrial, with essentially uniform leaves; width of fruit exceeding the height by 0.2 mm.; anthers 0.1–0.2 mm. wide; stigmas 0.2–0.4 mm. long.

b. Fruit sessile; margins of carpels not revolute.

c. Fruit not gibbous at base (Fig. 3b) . . . . *C. terrestris.*

c. Fruit strongly gibbous at base (Fig. 7a) . . . . *C. peploides.*

b. Fruit pedicelled; margins of carpels thickened and revolute (Fig. 6a) . . . . *C. Nuttallii.*

a. Plants aquatic or subterrestrial, of diverse habit and foliage; width of fruit less than, or equalling, or barely exceeding the height; anthers 0.3–1.5 mm. wide; stigmas 0.7 mm. or more long.

d. Foliage coarse (Plate 1168); fruit widest above the middle (Figs. 13a, 13m); linear submersed leaves with tip of vein scarcely excurrent (Figs. 13h, 13s, 13An, 13Ao) . . . . . *C. heterophylla.*

d. Foliage delicate (Figs. 1–9 on Plate 1169); fruit of equal width above and below the middle (Figs. 16b, 16f); linear submersed leaves with tip of vein slightly excurrent (Fig. 16e) . . . . *C. anceps.*

Callitriche in Mexico and Central America

a. Fruit gibbous at base.

b. Base of each mericarp turned at nearly right angles to the face of the fruit (Fig. 7a); margins of carpels not winged . . . . *C. peploides* var. *peploides.*

b. Base of each mericarp slightly twisted (Figs. 7b, 7d); margins of carpels winged.

c. Margins of carpels thin, with an erect wing at summit (Fig. 7b) . . . . *C. peploides* var. *semialata.*

c. Margins of carpels thickened, with the wing turned outward (Fig. 7d) . . . . *C. peploides* var. *media.*

a. Fruit not gibbous at base.

d. Plants terrestrial, with essentially uniform broadly oblanceolate leaves (Fig. 2a); width of fruit exceeding the height by 0.2 mm. (Fig. 2b); carpels narrowly winged around the margin; anthers 0.1–0.2 mm. wide; stigmas 0.2–0.4 mm. long . . . . *C. deflexa* var. *subsessilis.*

d. Plants aquatic or subterrestrial, of diverse habit and foliage (Plate 1168); width of fruit about equalling the height (Figs. 13a, 13w); anthers 0.3–1.5 mm. wide; stigmas 1–6 mm. long . . . . *C. heterophylla.*

Callitriche in South America

a. Plants terrestrial, with uniform broadly oblanceolate leaves (Figs. 10 & 13 on Plate 1169); stem and leaves without stellate scales; stamens 0.2–1.2 mm. long and not elongating as the fruit develops; anthers 0.1–0.2 mm. wide; flowers without bracts.

b. Width of fruit exceeding the height by 0.1 mm. (Fig. 1a); face of mericarps convex (Fig. 1b) . . . . *C. turfosa.*

b. Width of fruit exceeding the height by 0.2 mm. (Fig. 2b); face of mericarps nearly flat (Fig. 2c).
c. Fruit mostly 0.7 mm. or more wide, on pedicels 0.5–4 mm. long . . . . *C. deflexa* var. *deflexa.*
c. Fruit mostly 0.5–0.7 mm. wide, on pedicels 0.1–0.3 mm. long . . . . *C. deflexa* var. *subsessilis.*
a. Plants aquatic or subterrestrial, of diverse habit and foliage (Plate 1168); stem and leaves usually with scattered stellate scales (Figs. 17c, 17d); stamens elongating as the fruit matures, to 1.5–3 mm.; anthers 0.3–1.5 mm. wide; flowers usually with 2 whitish inflated bracts at base.
d. Carpels not winged.
e. Fruit 0.7–1.2 mm. wide, the height equalling or slightly exceeding the width (Figs. 12a, 12c, 17a).
f. Fruit 0.7–1.2 mm. wide, usually of equal width above and below the middle (Figs. 17a, 17e) . . . . *C. nubigena.*
f. Fruit 1.2–1.4 mm. wide, usually a little the widest above the middle (Fig. 12c) . . . . *C. heteropoda.*
e. Fruit 1.4–1.5 mm. wide, a little wider than high (Fig. 14a) . . . . *C. quindiensis.*
d. Carpels wing-margined.
g. Wing not extending around base and apex of each mericarp.
h. Fruit sessile or nearly so; wing well-developed at summit and sometimes base of the carpel, narrower or absent down the sides (Fig. 11a) . . . . *C. albomarginata.*
h. Fruit sessile or pedicelled, sometimes both on the same plant; wing of equal width around the carpel.
i. Fruit 1.0–1.4 mm. wide, usually wider than high (Figs. 18a, 18d, 18g).
j. Fruit sessile or nearly so . . . . *C. Lechleri* var. *Lechleri.*
j. Fruit pedicelled . . . . *C. Lechleri* var. *Berteroana.*
i. Fruit 0.7–0.9 mm. wide, higher than wide (Fig. 20c) *C. oblongicarpa.*
g. Wing extending around the base and apex of each mericarp (Fig. 22b) . . . . *C. rimosa.*

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PROBLEMS IN INDICATING PLANT DISTRIBUTION

O. A. Stevens

I think that Fernald partly answered his query, "Why so many careless books on trees and other plants" (Rhodora 52: 272) in his first sentence: "Everyone is interested in trees." Without attempting to present statistics I would venture that many hundreds of books have been written about trees and most of them are somewhat popular in nature. The distribution of trees has been a matter of much interest and maps for this have been used in many handbooks.

It must be apparent that the mapping of distributions involves two problems: (1) basic information; (2) method of presentation. We are aware of shortcomings in our knowledge but have no adequate inventory of them. Little has been done in the exploration of better methods of presentation.

Anyone who has made a careful study of any species of plant has found errors in the information previously available. Often these errors have been relatively apparent when brought to attention but have been quoted repeatedly without an attempt at verification of the facts. The reasons are not difficult to find. Each worker makes only a small contribution to the advancement of knowledge. He must depend upon earlier work, for, if each were to begin at the beginning, little advancement could be made.

Few people, if any, are familiar with all facts on the distribution of a single species, not to mention the large number of species discussed in a handbook. No one has access to all of the published material, much less to that which is unpublished. If one attempts to make a full survey of it for even a few plants he soon is bogged down in the details of this endeavor. It is not surprising that most authors have contented themselves with the "most pertinent" literature and ignored the rest.

The preparation of a distribution map involves much effort and expense. Once made it is easily copied. It is far easier to criticize than to present something that will have a high degree of acceptability. A dot on a map may indicate the source of a definite specimen, but what does it tell of the abundance of the species? A line may indicate the approximate limit of distribution but over the greater part of the distance the position of this line must be somewhat arbitrary. One who is familiar with the alleged boundary at any point is likely to find fault with its position. Rarely are the data sufficient to form an undebatable line.

The problem of delimiting is difficult in marginal areas. Distributional maps for a species have usually employed a limiting line, a solid or cross-hatched figure. Maps of population, agricultural or natural products, manufactures, etc., usually employ a graded series of characters. The data for these are relatively exact while those for plant populations are quite otherwise in most cases.

Reference was made to maps in a particular book on trees. The map of forest areas was taken from the Forest Service and should have been as good as any that could be used. I had submitted to the author a list of suggested changes in species maps so far as North Dakota is concerned. *If* he received a sufficient number of such lists, *if* they were reasonably in agreement and *if* the economics of publication permitted, new maps could be made for a later edition.

Mapping becomes difficult in the border areas where a species may be limited to small, scattered places where conditions are favorable. Along the western edge of the forested region small areas of trees, especially where deep, sheltered ravines occur, allow true forest herbs to persist. A gradual thinning out of dots or lines would seem to show this to best advantage, but this does not serve well for small scale maps.

Perhaps a better treatment for small scale maps would be an outline of the area with occasional dots to represent records near the boundary both in the area and beyond it. This should help convey the idea that the limit is only approximate, since readers are likely to place variable interpretations upon reports of material with which they are not familiar.

The use of a solid black area gives a bold impression, but to the mind of the present writer it is entirely too bold and accentuates the errors as well as the facts. Such a map for *Populus deltoides* (Collingwood,—Knowing Your Trees—adapted (?) from U. S. D. A. Misc. Publ. 287 in which distribution patterns of the trees followed along more or less imaginary streams) may give a quite erroneous idea of the distribution of this tree in North Dakota. Actually it is largely absent from the eastern and northern part of the State (as a native plant) and confined principally to the Missouri and Little Missouri River valleys.

Verbal outlining of the area saves labor and space but leaves the reader to picture the limits in his mind. When it reads "Wis. to Mont.", where would be the northern limit? Most readers will be familiar with political boundaries but not with ecological ones. The ecologist is probably less concerned with the overall distribution than with local associations. The marginal areas are even more troublesome by the descriptive method.

The Seventh edition of Gray's Manual had such generalized statements of range that it was difficult to suggest changes except to ask for more definite ones. Now with those given in the Eighth edition further suggestions are more easily offered.

Treatment of familiar naturalized species is much curtailed and this is understandable but these plants are important as weeds. *Cannabis sativa*, "chiefly sporadic, Que. to B. C. and southward," gives no hint that it is well established and reaches a northern limit somewhat south of North Dakota. *Abutilon Theophrasti*, *Plantago lanceolata* and *Cichorium Intybus* are in a similar position.

I had submitted a North Dakota specimen of *Fraxinus nigra* but the new range, "Man., N. D." might suggest the entire State to some people. To those who are somewhat familiar with tree distribution in general it might mean eastern North Dakota. Actually it is a small area in the northeast. Perhaps it would be better to omit the State where only one or two records are known as for *Fraxinus nigra* and *Ulmus rubra* in North Dakota at least unless the qualifying "e", "ne", etc. are used.

Fernald was of course less familiar with the plants in the western edge of the Manual's range and was not as interested in that area as he was in New England. I find it hard to understand, however, that he should not have given more attention to the relatively few publications which cover the western border and also to the broad distributional features of that section. One of the latter which I believe has received little attention is the northern wedge between the Missouri River and the Red River of the North. *Rorippa sinuata*, *Lythrum alatum*, *Specularia leptocarpa*, *Dyssodia papposa* and even *Solanum rostratum*, are some of the plants which are lacking in this triangle though found farther north to the westward—the northern border of the upper Austral Zone.

North Dakota is beyond the range covered by the Manual and thus little detail of its flora could be considered. Minnesota however, is commonly indicated in the extension of species only as "Minn." The floras of its southern Mississippi Valley, southwestern prairie and northern forest are so different that a more frequent use of se, sw, and ne would have much increased the informational value to readers who are unfamiliar with existing conditions.

Ribes odoratum provides an example of a need to check original source material. The range given in the Manual, "S.D. east to Minn." was apparently taken from Berger (Cornell Tech. Bull. 109) and was inaccurate. The plant is frequent in western North Dakota and extends slightly into Saskatchewan. It does not occur east of the Missouri River and is "probably not native anywhere in Minnesota" (Rosendahl, Trees and Shrubs of Minn.). Incidentally, why did this shrub, which becomes almost a weed when planted, remain in such a limited area?

The above remarks may seem adverse comments on the new manual. They are intended as comments on a problem in which I have long been interested. The citations serve to illustrate the difficulties of interpretation by readers of what may seem apparent to the author and of some of the pitfalls which beset the author.—Department of Botany, North Dakota Agricultural College, Fargo, North Dakota.

PERLUSTRATIONES PLANTARUM ARCTICARUM

I(*bis*).[1] Arctic Dicotyledonous Species: Four New Names or Combinations

Nicholas Polunin

For more than a decade the writer has been gathering material and assembling notes for a circumpolar treatment of all the species of vascular plants which are known to occur north of the southern boundary of the Arctic as he has delimited it for this and allied purposes.[2] The original intention was to produce little more than a check-list, but in deference to requests for a more usable treatment the project has now grown to include *for each species* range-citations as far as known within the Arctic, mention of its most characteristic habitat or habitats, English names as well as any synonyms that are considered necessary for reference to arctic literature, and, in addition, sufficient descriptive data for characterization or at least separation of all the families, genera, and species involved. So far, approximately all of the genera and

[1] The initial paper in this series was published in the *Journal of Botany*, LXXX, pp. 81–94, "May 1942," the gap in time and interpolation of this contribution, being due to the cessation of publication of that periodical after acceptance of further instalments (designated II, III, IV, etc.) which it is hoped shortly to retrieve for publication here.

[2] Cf. Proceedings of the Seventh International Botanical Congress, Stockholm. 1950 (in Press) and "The Real Arctic: suggestions for its delimitation, subdivision, and characterization," *Journal of Ecology*, vol. 39, 1951 (in Press).

nearly half of the species are illustrated by line drawings, and there are numerous habitat photographs available. For this compilation, a preliminary draft of which has now been completed, a rather broad view was taken of specific limits, and many of the species recognized are admittedly aggregates. No attempt has been made to deal with intraspecific taxa, and it is doubted whether a critical circumpolar treatment of many groups is attainable without more Russian material than is at present available in the herbaria of North America and western Europe. In material from most other areas of the vast regions involved we are now incomparably better off than were Ostenfeld and Gelert when working towards their unfortunately abortive "Flora Arctica" half-a-century ago, and it is no small tribute to the labors of subsequent generations of arctic and allied botanists that there seems to be no need to erect any new entities now. It is, however, necessary to publish the following new names and combinations for species recognized in the writer's circumpolar treatment.

Cerastium scammaniae, nom. nov. (*C. vulgatum ϑ grandiflorum* lusus 1, Fenzl in Ledebour, Fl. Rossica, I, p. 410, 1842; *C. beeringianum* var. *grandiflorum* (Fenzl) Hultén, Fl. Aleutian Islands, p. 165, 1937; *C. fischerianum* of authors, not Sér.; *C. alpinum* of authors, not L.).

This in full development seems to constitute a species separate from *C. beeringianum* to which it has been linked particularly by Hultén (*loc. cit.* and cf. Fl. Alaska and Yukon, IV, p. 665, 1944), being tall and loosely tufted with hairy and slightly glandular stems 15–35 cm. long having the upper internodes commonly about 8 cm. in length, and more or less broadly ovate and acute upper leaves that may exceed 1 cm. in diameter and be scarcely longer than they are wide. The inflorescence is a widely forking cyme of showy flowers having broad petals about 12 mm. long in the larger flowers and sepals usually half this length. The epithet "grandiflorum" being preceded (several times) in the specific category, it is a great pleasure to name this attractive plant after the very gallant lady whose special collecting and photography of it in the vicinity of Teller on Seward Peninsula in 1949 settled the writer's lingering doubts as to whether it should be regarded as a distinct species. Cited by Fenzl from several stations in the Beringian region, our plant forms conspicuous tall tussocks in open gravelly spots or on damp grassy slopes. Dr. Bassett Maguire supports our contention that *C. scammaniae* represents a separate species.

Lagotis hultenii, sp. nov. affinis L. glaucae a qua differt saepe gracilior, filamentis longioribus, antheris minoribus (circa 0.5 mm. longis et latis) sed magis exsertis, tubum circa 2 mm. excedentibus (galea et tubus aequilonga), bracteis superioribus angustioribus et tenuioribus, plerumque serratis dentibus acutibus, seminibusque longioribus, circa 7 mm. longis.

The existence of this distinct but unnamed species of *Lagotis* was mentioned by Professor Eric Hultén (Fl. Alaska and Yukon, IX, p. 1358, 1949) who gave its range as "Europe: from Kanin and Nova Zembla south in the Urals to about 60° N., isolated report from about 55° N. Asia: the Urals, lower Obi and Yenisei rivers." Although the present writer has not seen material from by any means all of these regions, he has examined enough to convince him that this entity stands out as sufficiently distinct for specific recognition in the variable complex to which it belongs, and designates as type a specimen which he saw in the herbarium of the Naturhistoriska Riksmuseum, Stockholm, labelled "Lilla Briochovski ōn 1876 . . . Sv. exp. til Jenisej." Sole credit for distinguishing this species rests with Professor Hultén, after whom it is a pleasure to name it, and who had in 1930 (Fl. Kamtchatka, IV, p. 104, left-hand figure) published a drawing of the upper part of the flower.

Petasites glacialis, comb. nov. (*Nardosmia glacialis* Ledeb., Fl. Rossica, II, p. 466, 1845).

The differences between *Petasites* and *Nardosmia* are so slender and little constant that it is not now customary to uphold the latter as a distinct genus. As this and the following species both seem to fall within the generic limits of *Petasites* as usually accepted nowadays (at least in all except such minor characters as their usually monocephalous habit), as far as could be determined from the limited material available, it is necessary to make appropriate combinations for them.

Petasites gmelinii, comb. nov. (*Nardosmia "Gmelini"* Turcz. ex DC., Prod., VII, p. 271, 1838).

It will be noticed that, in accordance with the resolutions for improvement of the "International Rules of Botanical Nomenclature" which were passed during the Seventh International Botanical Congress at Stockholm in 1950, the recommendations are followed of using a lower case initial for the specific epithet and also a "corrected" termination.—Gray Herbarium of Harvard University.

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THE GENUS ILEX IN TENNESSEE[1]

FRANK W. WOODS

INTRODUCTION

WHILE on an extensive collecting trip during the fall of 1949, the writer had an unusually good opportunity to observe variation in numerous species of plants and to make extensive collections of certain groups under critical observation. The genus *Ilex* was one of the most interesting. It was found that the limitations imposed by the descriptions available excluded certain forms of the various species. Therefore, a revised approach to classification seemed to be necessary to replace the rigid descriptions in use. This does not mean that entirely new descriptions should be drawn up, but that the ones in use should be extended and modified to keep pace with the dynamic taxonomy of the present day. This study represents a step in that direction with reference to the Tennessee material.

The genus *Ilex* is geographically interesting. It is world wide in distribution and in some instances the same species occur in both Asia and eastern North America. Such a cosmopolitan distribution makes a detailed study of the entire genus on a field basis nearly impossible. Yet, the character of the populations is such that field study is necessary before sound taxonomic conclusions can be reached. It follows, then, that the conclusions of such a study as the present one must be tentative and must be considered to apply in particular to the Tennessee material.

Field study, including adequate sampling of local material, careful habitat notes, and ecological observations, are especially

[1] Contribution from the Botanical Laboratory, University of Tennessee. N. Ser. No. *127*.

essential to an understanding of the genus *Ilex* in Tennessee. Here there are no discontinuities of morphological characteristics, but gradual clines exist from the basic species into the various varieties and forms. This lack of distinct morphological disjunctions often makes determinations difficult.

Since it is not possible, then, to successfully assign the individuals in the Tennessee populations to traditionally and strictly defined species, it has been the practice of the writer to state his interpretation of the range of variability of each of the species recognized. The *variety* will be used as a designation for subspecific groups of two types: one, for segregates which are geographically disjunct, and two, for segregates which are morphologically distinct but which are not disjunct. The *form* is used to describe the extreme ends of clines which are found within the known range of the species.

Acknowledgements

Sincere appreciation is accorded Dr. A. J. Sharp and Dr. R. E. Shanks of the University of Tennessee, for suggestions as to improvement of the text and for assistance in making collections.

The curators of the herbaria at the following institutions have graciously permitted the use of material in their care:

University of Alabama (ALA); U. S. Forest Service Herbarium, Washington (FS); Gray Herbarium, Harvard University (G); George Peabody Teachers College (GP); Missouri Botanical Garden (M); U. S. National Herbarium (NH); Park Headquarters Herbarium, Great Smoky Mountains National Park (PH); University of the South (S); University of Tennessee (T); University of Chattanooga (UC); University of North Carolina (UN).

Historical Account

The name *Ilex* is the one originally proposed for the genus. Since its proposal in 1735, by Linnaeus, at least nineteen others have entered the literature. Of these, Prinos, proposed in 1737 by Gronovius, has enjoyed the second greatest popularity. Under present rules of nomenclature, *Ilex* is the proper name.

In 1838, Rafinesque perpetrated a masterpiece of splitting when he divided the genus into five new segregate genera. It is, perhaps, not strange that a genus with such a wide variation in leaf type should have been so often divided into smaller groups.

The only major monographic study of the North American species of *Ilex* was published in 1901 by Loesener. The weakness of his treatment of this genus reflects the complexity of the populations and the necessity for field work.

Economic Importance

All of the species of holly that occur in Tennessee, with the exception of *Ilex opaca* (American Holly), are of little commercial value. However *Ilex decidua* probably has some economic value as a soil holder when it grows along streamsides. *Ilex opaca* is valued for its creamy white wood and for its leaves. The wood is used for furniture inlays, handles, and various fixtures, often being dyed black to imitate ebony. Its leaves and fruits are highly prized for wreath making and decorations at Christmastime, and some of the most beautiful plants of this species have been wantonly destroyed for this purpose.

Procedures

Wherever it was possible, specimens collected and notes made on field trips were used. However, it is always desirable to compare these data and make use of specimens collected by other workers. When this is done, the problem of maintaining a given set of standards as to varying degrees of pubescence, color, leaf texture, and other characteristics, becomes apparent. Specimens which were studied the year, month, or even the week before may be judged by standards which differ slightly from the ones being used at the present time if reference standards are not used.

For this reason, a standardized check sheet (see fig. 1) was prepared and used for approximately three hundred specimens. On this sheet were first recorded the complete collection data. Next the plant specimen was examined. All characteristics regarded as being important were standardized and units of length, shape, size, texture, etc., were assigned to each. For varying degrees of pubescence and for leaf shapes, standard specimens were selected and mounted under glassine covers. By doing this, the same objective standards were used during the entire period of study and a complete record of all specimens studied was readily available at any time. This proved helpful after specimens borrowed from other herbaria were returned.

In citing specimens, one collection from each county is used.

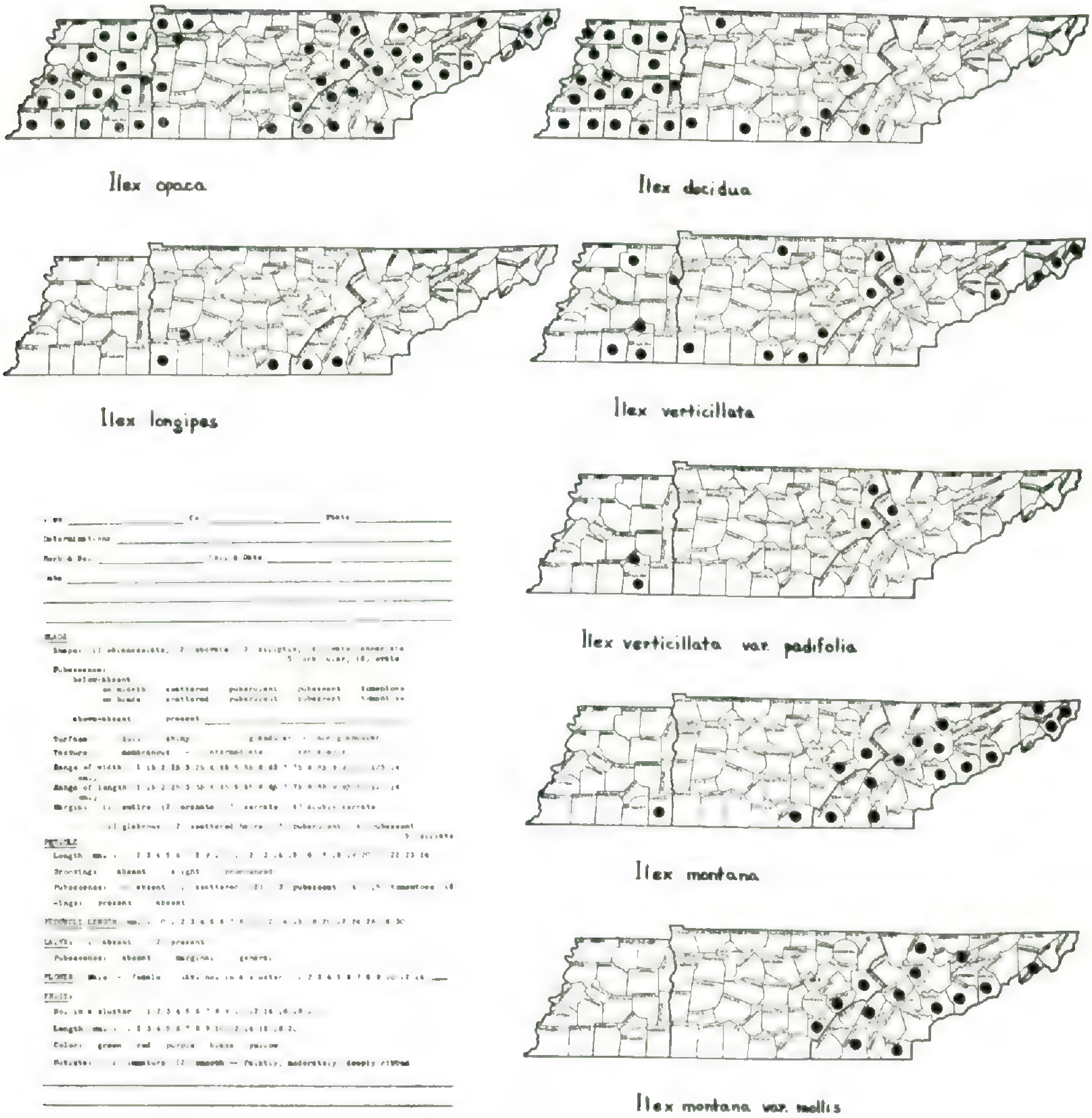

Figure 1

Systematic Treatment

Ilex, (Tourn.) Linn., Syst. ed. I (1735). Sp. Pl. (1753).

Prinos, Gronov. in Linn., Coroll. Gen. 6 (1737). *Aquifolium*, (Tourn.) Adams, Fam. II (1763). *Macoucoua*, Aubl., Pl. Gui. I (1775). *Labatia*, Scop., Introd. (1777). *Othera*, Thunb., Nov. Gen. (1783). *Winterlia*, Moench, Meth. (1794). *Paltoria*, Ruiz and Pav., Prod. 13 (1794). *Hexotria*, Rafin., Am. Monthly Mag. IV (1818). *Chomelia*, Vell., Fl. Flum. I (1827). *Ageria*, Rafin., Sylva Tellur. (1838). *Arinemia*, Rafin., ibid. *Braxylis*, Rafin., ibid. *Ennepta*, Rafin., ibid. *Synstima*, Rafin., ibid. *Prinodia*, Griseb. in Goett., Abh. VII (1859). *Pileostegia*, Turcz., Bull. Soc. Nat. Mosc. 32 (1859). *Leucodermis*, Planch. in Benth. and Hook., Gen. Pl. I. (1862). *Pseudehretia*, Turcz., Bull. Soc. Nat. Mosc. 36 (1863).

Shrubs or trees. Leaves alternate, simple, deciduous or persistent. Flowers white, 4–8-merous, imbricated in the bud, borne in the axils of the leaves; calyx persistent; stamens adnate to the base of the corolla. Fruit a 4–8 seeded drupe, usually red.

Artificial Key to the Species of Ilex Found in Tennessee

a. Leaves evergreen and coriaceous, usually armed with stiff marginal spines . . . . 1. *I. opaca.*
a. Leaves not evergreen or coriaceous, marginal spines never present . . . . *b.*
  b. Calyx 4-merous and glabrous; leaf margins crenate or nearly entire . . . . *c.*
    c. Pistillate peduncle much longer than the fruit or flower; nutlets smooth or faintly ribbed . . . . 2. *I. longipes.*
    c. Pistillate peduncle shorter than or equal to the fruit or flower; nutlets strongly ribbed . . . . 3. *I. decidua.*
  b. Calyx 4-7-merous and with varying degrees of pubescence; leaf margins serrate or doubly so . . . . *d.*
    d. Calyx pubescence mainly ciliate; nutlets smooth; found in wet habitats (bogs and stream banks) . . . . 4. *I. verticillata.*
    d. Calyx pubescence more general; nutlets with striate ridges; found in well drained habitats . . . . 5. *I. montana.*

1. **Ilex opaca** Soland. in Ait. *Ilex Aquifolium* Marsh., Arbust. Am. 63 (1785). *Ilex canadensis* Marsh., Arbust. Am. 64 (1785). *Ilex laxifolia* Lam., Encyc. III (1789). *Ilex opaca* Soland. in Ait., Hort. Kew. ed. I (1789). *Ilex americana* Lam., Jour. Hist. Nat. Par. I (1792). *Ilex quercifolia* Meerb., Icon. Sel. 2, t. 5 (1798). *Ageria opaca* Rafin., Sylva Tellur. 47 (1838).—Shrub or tree up to 50 feet tall; leaves evergreen, elliptic to ovate, dull above, lighter green and glabrous below, coriaceous, armed with many marginal spines or with few or none in forma *subintegra* Weath.; calyx 4-merous and remotely ciliate; drupes red, or yellow in forma *xanthocarpa* Rehd.; nutlets grooved.

Distribution: Ilex opaca is found in all of the physiographic provinces of Tennessee with the exception of the Central Basin. Its distribution in the Highland Rim is limited to the more moist sites. *Specimens Examined.*—Anderson: Oliver Springs, *Jennison 3270* (t); Blount: pine-oak woods, Russell Field, GSMNP, *Jennison 1570* (ph, t). Campbell: Jellico, about 1000′, sandy loam in moist small growth woodlot, *Lamb & Williams, July 30, 1934* (t). Carroll: bottoms of Big Sandy River SE of Buena Vista, *Sharp, Clebsch & Clebsch 8494* (t). Carter: swamp along Stony Creek east of Elizabethton, *Sharp, Fairchild & Clebsch 11748* (t). Chester: gum swamp 3 miles N. of Henderson, *Woods, Shanks & Hardin 15728* (t). Cocke: with *Rhododendron maximum* on well drained slope, *Woods 15363* (t). Cumberland: in gorge of Ozone Falls, *Shanks, Woods & Cooley 13868* (t). Franklin: Alto Road, *P. H. W. Webb 223* (t, s). Hamilton: Signal Mountain., Chattanooga, *Sharp, Hesler & McGilliard 1042* (t). Hardeman: Hatchie River bottoms near Pocahontas, *Woods, Shanks & Cooley 14643* (t). Hardin: upland oak forest, Shiloh National Military Park, *Woods, Shanks & Hardin 15692* (t). Haywood: dry oak woods on hill near Eurekaton, *Sharp & Clebsch 6721* (t). Henderson: dry slope near Cub Lake, Natchez Trace State Park, *Sharp, Clebsch, Clebsch & Fairchild 9342* (t). Johnson: Cole's Bog near Shady Valley, *Shanks 1110* (t). Knox: Knoxville, *Miranda Berry 1, 1896* (t). Lauderdale: woods in creekbottom west of Halls, *Sharp, Clebsch, Clebsch & Fairchild 7998* (t). Madison: roadside bank north of Big Springs, *Sharp, Underwood & Clebsch 6844* (t). McNairy: moist soil along creek north of Stantonville, *Sharp, Clebsch & Clebsch 185* (t). Morgan: Clear Fork River, Rugby, *Jennison, Sharp & Hesler 1189* (t). Polk: lower

part of Smith Mt., *W. A. Dayton 722* (FS). Rhea: Edwards branch of Soak Creek above Little Piney, *Woods, Shanks, & Cooley 14015* (T). Roane: Rockwood, *D. M. Coffman 101* (NH). Sevier: Rich N. slope on Webb Creek, *Woods 15362* (T). Shelby: Wolf River bottoms, *C. E. Moore H548* (T). Wayne: SE. of Collingwood along Holly Creek, *Sharp, Clebsch & Clebsch 4979* (T). Weakley: bottoms of Middle Fork of Obion River NE. of Greenfield, *Sharp, Clebsch & Fairchild 7803* (T).

Perhaps no other tree in the United States is familiar to so many people as *Ilex opaca*. It is found in sites which vary from fairly dry woods to the edges of creeks and in swamps. Its coriaceous leaves belie its truly mesic nature. Its exclusion from the Central Basin of Tennessee is indicative of the often excessively drained condition of the soil in that part of the state.

Ilex opaca was described by Solander in Aiton's *Hortus Kewensis* ed. I in 1789. In the past, it has been the practice to cite the authority as Aiton, when naming the species. The writer suggests that in the future, Solander be given proper credit.

2. **Ilex longipes** Chapm. *Ilex longipes* Chapm. in Trelease, Trans. Acad. Sci. St. Louis V (1889). *Nemopanthes canadensis* Gatt., Tenn. Flora 31 (1901).—Shrub; leaves deciduous, elliptic to obovate, glabrous or with dense pubescence on midrib below, dull above, subcoriaceous, faintly to remotely serrate; pistillate peduncles 13–20 mm. long, longer than the staminate; calyx glabrous, 4–5-merous; drupe red; nutlets faintly to deeply ribbed.

Distribution: In the south-central part of the state. Found in habitats which vary from thin limestone soil to moist creeksides. *Specimens Examined.* —Franklin: Cowan, *A. Gattinger, August 13, 1886.* Hamilton: Lookout Mt., *McGilliard, September 17, 1931* (UC). Lewis: moist soil near Hohenwald, *Charlesworth 3323* (T). Marion: top of Walden Ridge, *Ford & Russell 2231* (T). Wayne: Along Butler Creek, NW. of Iron City, *Woods, Shanks & Cooley 9155* (T).

This is the least known of all of the species of Tennessee hollies, partly because of its limited distribution and partly because of the lack of collecting in areas in which it is present. The single collection made by the writer was beside a creek in a moist boggy site. This is in sharp contrast with the habitats in which other collections have been made, indicating a wide range of ecological amplitude. With such a large variety of sites represented from which the few collections have been taken it is strange that more plants have not been found.

3. **Ilex decidua** Walt. *Ilex decidua* Walt., Fl. Carol. (1788). *Ilex prinoides* Soland. in Ait., Hortus Kewensis ed. I. (1789). *Ilex aestivalis* Lam., Encyc. iii; and in Jour. Hist. Nat. Par. 1 (1792). *Ilex tenuifolia* Salisb.,

Prodr. (1796). *Bumelia crenulata* Spreng., Syst. I (1801). *Ilex ambigua* Ell., Sketches ii (1824). *Prinos deciduus* DC, Prodr. II (1862). *Prinos deciduus* var. *aestivalis* (Lam.) DC, Prodr. II (1862).—Shrub up to 25 feet high; leaves deciduous, spatulate or oblanceolate to elliptical, pilose to pubescent on midrib below, dull above, membranous to sub-coriaceous, crenate to obtusely serrate; staminate peduncles longer and thinner than the pistillate; calyx square and glabrous; drupes red; nutlets deeply ribbed.

Distribution: Western and central Tennessee in low wet thickets, bottoms and boggy habitats as far east as White County. It may be found at times on well drained sites. *Specimens Examined.*—Benton: high bottoms of the Tennessee River, *Woods, Shanks & Hardin 15626* (t). Carroll: bottoms of Big Sandy River SE. of Buena Vista, *Sharp, Fairchild, Clebsch & Clebsch 8467* (t). Crockett: bottoms of the Middle Fork of the Forked Deer, *Woods, Shanks & Cooley 14745* (t). Decatur: bottoms along Sick Creek near Cozette, *Woods, Shanks & Cooley 14929* (t). Dyer: in cultivated field under *Quercus macrocarpa, Woods, Shanks, & Hardin 15651* (t). Fayette: Roper farm near Loosahatchie River north of Warren, *Woods, Cooley, & Shanks 13331* (t). Franklin: rocky limestone slope S. of Sewanee, *Sharp 1296* (t). Giles: roadside south of Pulaski, *Sharp, Clebsch, Clebsch & Fairchild 9799* (t). Grundy: gravels of Collins R., Tarleton, *Svenson 9378* (t, nh); Hamilton: Soddy, *A. Bryant & McGilliard, July 7, 1949* (uc). Hardeman: Hatchie River bottoms near Pocahontas, *Woods, Shanks, & Cooley 14631* (t). Hardin: near Saltillo, 25 feet high, *Woods & Clara Davey 14586* (t). Haywood: near Lost Creek east of Forked Deer, *Woods, Shanks & Cooley 14750* (t). Henderson: bottoms of Beech River SW. of Chesterfield, *Sharp, Clebsch, Clebsch & Fairchild 9281* (t). Henry: near Jones Mill in wet bottoms, *Sharp, Clebsch & Clebsch 6101* (t). Lake: Choctaw Island, Reelfoot Lake, *Shanks 1251* (t). Lauderdale: mesic slope above Mississippi bottom west of Arp, *Woods, Cooley & Shanks 13618* (t). Madison: roadside bank N. of Hunterville, *Sharp, Adams & Felix 12540* (t). McNairy: roadside bank SW. of Pocahontas, *Sharp, Clebsch & Clebsch 159* (t). Montgomery: dry wooded hillside 2 miles east of Clarksville, *Woods & A. Clebsch 14473* (t). Obion: edge of Reelfoot Lake, *D. E.* and *M. S. Lyles 8391* (g). Shelby: Loosahatchie River bottoms near Lucy, *Woods, Cooley & Shanks 13511* (t). Tipton: Covington, *James Byars, October 12, 1888,* (nh). Wayne: bluff along bottomland forest, *W. B. McDougall 1626* (nh). Weakley: roadside ditch near Palmersville, *Sharp, Clebsch & Clebsch 6088* (t). White: rocks at edge of river below Great Falls Dam, *Shanks, Sharp, & E. Clebsch 5588* (t).

The variability in the leaf shape, size, and texture of *Ilex decidua* is great and one must study the field populations carefully in order to understand the species as an entity. For an example, the writer has made collections of different plants from the same populations. An open-grown plant (Woods, Shanks, and Cooley 14916), from which collections were made, has leaves that are smaller in size and more ovate than the leaves of a shade-grown plant (Woods, Shanks, and Cooley 14838) which is a part of the same population. The same differences can be observed in other plants, having grown in different ecological niches. A specimen

collected in a cedar (*Juniperus virginiana*) glade has leaves similar in form and size to the open-grown plant cited above. Leaves of this species may be extremely large. One such plant had leaves with a maximum length of 11 cm. The maximum leaf-length of the cedar glades plant cited above was 4 centimeters.

4. **Ilex verticillata** (L.) Gray. *Prinos verticillatus* Linn., Sp. Pl. (1753). *Prinos confertus* Moench, Meth. (1794). *Prinos Gronovii* Michx., Fl. Bor. Am. II (1803). *Prinos padifolius* Willd., Enum. Hort. Berol. (1809). *Prinos prunifolius* Desf., Tabl. ed. II (1815). *Prinos ambiguus* Michx. Fl. Bor. Am. II. 236. (1803). *Ilex verticillata* (L) Gray. Man. Bot. N. U. S. ed. II (1856).—Shrub; leaves deciduous, obovate to ovate-lanceolate, dull above and sometimes with scattered hairs, pilose to tomentose midrib and veins below, membranous to sub-coriaceous, margin nearly entire to strongly doubly serrate; all flowers short stalked; calyx 5–7-merous, ciliate, glabrous to pubescent; drupe red; nutlets smooth or faintly ribbed.

Distribution: Swamps, bogs, and streamsides scattered throughout Tennessee. A plant of wet habitats. *Specimens Examined.*—Benton: boggy meadow opposite Sandy Point School, *Woods, Shanks & Cooley 13650* (t). Carroll: bottoms of Crooked Creek north of Huntingdon, *Woods, Shanks & Cooley 13739* (t). Carter: swampy woods of Shady Valley, *Sharp, Adams, Hernandez & Fairchild 11687* (t). Chester: west of Chickasaw State Park, *Woods, Cooley & Shanks 9237* (t). Cocke: between Paint Rock and Del Rio, *T. H. Kearney 634* (nh). Cumberland: woods 20 miles north of Crossville, *Sharp & Jennison 3390* (t). Fentress: boggy area along Glade Branch, *Woods, Cooley & Shanks 14161* (t). Grundy: boggy meadow between Tracy City and Coalmont, *Shanks, Sharp & E. Clebsch 5448* (t). Hardeman: low forested area at edge of lake in Chickasaw State Park, *Woods, Shanks & Cooley 9227* (t). Hardin: creek bank in Shiloh National Military Park, *Woods, Shanks & Hardin 15691* (t). Henry: bottoms along Tennessee River east of Paris, *Sharp, Clebsch, Clebsch & Fairchild 7682* (t). Johnson: Cranberry bog 5 miles SW. of Mountain City, *Woods, Shanks & Cooley 8709* (t). Lincoln: wet woods on Hurley Hopkins' farm E. of Taft, *Sharp, Clebsch & Clebsch 4898* (t). McNairy: near Moss Creek NW. of Ramer, *Woods, Cooley & Shanks 14714* (t). Scott: sandy ridge at No Business Creek, *Sharp, Shanks & E. Clebsch 3901* (t). Sumner: Wild Goose Pond, Mitchellville, *Woods, Shanks & Cooley 14304* (t). Unicoi: east Tennessee Mt. slopes at Unaka Springs, *Albert Ruth 260* (g). Warren: slightly boggy field one mile N. of Morrison, *Woods, Shanks & Hardin 15769* (t). Wayne: low hardwood forest, *W. B. McDougall 1157* (nh). Weakley: roadside bank near Hyndsver, *Sharp, Clebsch & Clebsch August 12, 1947* (t).

The sporadic occurrence of *Ilex verticillata* throughout Tennessee is notable. Always found in boggy or otherwise wet habitats, it can often be distinguished from *Ilex montana* on an ecological basis, the latter being found in better drained habitats. This is often necessary in the mountains of eastern Tennessee, where the leaves of *I. verticillata* are sometimes very much like those of *I. montana*, and the flowers and fruit are not present.

Its apparent absence from the Mississippi River bottoms is enigmatic, since many seemingly favorable habitats are present in this region.

4a. **Ilex verticillata,** var. **padifolia** (Willd.) T. & G. *Ilex padifolius* Willd., Enum. Hort. Berol. (1809). *Ilex verticillata* var. *padifolia* (Willd.) T. & G. ex Wats. Bibl. Ind. N. Am. Bot. 160. (1878).

As in the typical phase of the species but with short appressed downy pubescence on lower surfaces of leaf blades as well as the ribs.

Distribution: Sporadic throughout the range of the species. *Specimens Examined.*—CHESTER: bottoms of S. Fork of Forked Deer, *Shanks, Clebsch & Clebsch 9431* (T). CUMBERLAND: near swamp woods 20 miles N. of Crossville, *Jennison 3399* (T). FENTRESS: edge of boggy woods, *Woods, Shanks & Cooley 14210* (T). MCNAIRY: sweet bay-gum swamp at south edge of Bethel Springs, *Woods, Shanks & Cooley 14561* (T). MORGAN: shrubs along river, Rugby, *Svenson 9353* (G).

There are several collections of *Ilex verticillata* from Tennessee which the writer has determined as being var. *padifolia.* However, there is a cline between the extremely pubescent form and the glabrous form in which all degrees of variation can be found. The distinction between these is necessarily arbitrary.

5. **Ilex montana** T. & G. in Gray. *Ilex montana* T. & G. in Gray, Man. Bot. ed. I (1848). *Ilex ambigua* Torr., Fl. N. Y. ii (1843). Not *Prinos ambiguus* Michx., Fl. Bor. Am., ii (1803), source of the name. *Ilex monticola* Gray, Man. Bot. N. U. S. ed. II (1856). *Ilex Amelanchier* var. *monticola* Wood, Am. Bot. Fl. (1870). *Ilex dubia* var. *monticola* (Gray) Loesener, Mon. Aquifol. (Nov. Act. Abh. K. Leop.-Carol. Deutsch Akad. Naturforscher, lxxviii (1901). *Ilex ambigua* (Michx.) Chapm. sensu Gattinger, Flora of Tennessee (1901).—Shrub or small tree; leaves deciduous, ovate-lanceolate to elliptic, glabrous or with pubescence on midrib below, dull above, membranous to sub-coriaceous, serrate; staminate flowers clustered in the axils of leaves; calyx pubescent and sometimes ciliate; drupes red; nutlets strongly ribbed.

Distribution: Well drained slopes, ridges, and streamsides throughout eastern Tennessee. *Specimens Examined.*—ANDERSON: dry mixed woods above Norris Dam, *Iltis 2468* (T). BLOUNT: Gregory's Bald, GSMNP. *S. A. Cain, August 9, 1929* (T). BRADLEY: near Cleveland, *E. C. Magee, October 1, 1941* (G). CARTER: along Hinkle Branch above Unaka School on Holston Mt., *Sharp 1800* (T). COCKE: steep, rocky, well-drained slope near top of Cosby Knob, GSMNP, *Jennison & Raper 3282* (PH, T). CUMBERLAND: among conglomerate boulders on top of Black Mt. 5 miles SE. of Crab Orchard, *Woods & Sharp 7435* (T). FRANKLIN: plateau, *C. Gailor, 129* (S). HAMILTON: west slopes at base of Lookout Mt., *McGilliard & Brown, June 6, 1951* (T). HARDIN: bluffs along Tennessee River south of Prospect, *Woods, Shanks & Cooley 14610* (T). JOHNSON: north slope of Iron Mountain, mixed mesophytic forest, *Woods, Shanks & Cooley 8797* (T). KNOX: woods on slope, U. T. Farm, *Sharp, October 4, 1947* (T). RHEA: bottom of gorge in virgin hemlock-white pine forest, Little Piney Creek, *Woods, Shanks & Cooley 13969* (T). SEVIER:

along trail to Jake's Gap, GSMNP, *Woods 7413.* SULLIVAN: roadside between Bristol and Shady Valley, Holston Mt., *Sharp 7416* (T). UNION: near the Gourd, *Mrs. Kelly 2122* (T). VAN BUREN: Fall Creek Falls State Park, *Shanks, Sharp & Clebsch 4500* (T).

Ilex montana is somewhat intolerant of shade and reaches its best form when growing in open sites on well drained soil. The writer has seen this species reach its best form and greatest frequency on an old burn with *Halesia carolina* and *Prunus pensylvanica* (Woods 7413).

There seem to be two major races of mountain holly in Tennessee, the Cumberland form and the Unaka Range form. The former has leaves which are larger and more membranous than the latter, however, at one location visited by the writer in Cumberland County, the top of Black Mountain, the leaves of this species were much like the leaves of plants seen in the Unaka form. Here the specimens collected were on a dry and exposed site and shrubby in form, the largest specimen being only about 5 feet tall.

A single station for this species (Woods, Shanks & Cooley 14610) was found west of the Tennessee River. This location is isolated from the rest of the Tennessee populations, the nearest known stations are in Franklin County. It was found on a high and well drained bluff above the river.

5a. **Ilex montana,** forma **rotundifolia** forma nov. *A typo differt foliia orbiculatis vel suborbiculatis.*

As in the typical species but with leaves which are as broad as they are long or slightly narrower.

Distribution: Franklin County. *Specimens Examined.*—FRANKLIN: Type specimen, plateau, *C. Gailor 123* (s).

The roundness of the leaves in this form is found only in the southern part of the state in the Cumberland Plateau populations. Between Franklin County and the northern part of the state can be found many degrees of variation in this characteristic. In general, it can be said that the further south one goes in Tennessee, the more pronounced the roundness of leaves becomes.

5b. **Ilex montana,** var. **mollis** (Gray) Britton. *Ilex mollis* Gray, Man. Bot. N. U. St. ed. 5 (1867). *Ilex montana* var. *mollis* (Gray) Britton, Bull. Torr. Bot. Club XVII (1890). *Ilex dubia* Trelease ex Loesener in Koehne, Deutsche Dendrol. (1893). *Ilex monticola* var. *mollis* (Gray) Britton, Mem.

Torr. Bot. Club V (1894). *Ilex dubia* var. *mollis* (Gray) Loesener, Mon. Aqui. (1901). *Ilex montana* var. *mollis* forma *Grayana* Loesener, Mon. Aqui. (1901). *Ilex Beadlei* Ashe, Coult. Bot. Gaz. XXIV (1897). *Ilex dubia* var. *mollis* forma *Beadlei* (Ashe) Loesener, Mon. Aqui. (1901) *Ilex dubia* var. *Beadlei* (Ashe) Rehder, Man. Cult. Trees and Shrubs (1927). *Ilex Montana* var. *Beadlei* (Ashe) Fern., Rhodora XXXXI (1939).

As in the typical form but pilose to densely whitish tomentose on the lower leaf surface.

Distribution: Confined to the central and eastern part of the state, with the degree of pubescence increasing from west to east. *Specimens Examined.*—ANDERSON: left fork of Cove Creek, *W. A. Gresh, September 15, 1936* (T). BLOUNT: pine woods on Chilhowee Mt., GSMNP, *Jennison & Fleetwood 1886* (PH). CAMPBELL: valley of Stinking Creek SE. of Elk Valley, *Charles Gibson, no date* (T). COCKE: with black pine at Point Creek, *W. W. Ashe, October 13, 1922* (NC). CUMBERLAND: among conglomerate boulders on top of Black Mt. 5 miles SE. of Crab Orchard, *Woods & Sharp 7436* (T). GRAINGER: Clinch Mt. on U. S. 25E, *S. A. Cain, May 13, 1945* (T). GRUNDY: head of Fiery Gizzard Cove, Tracy City, *Shanks, Sharp & E. Clebsch 5331* (T). POLK: ridge N. of Hiwassee River, *W. A. Dayton 674* (FS). RHEA: Edwards Branch of Soak Creek, *Woods, Shanks & Cooley 14022* (T). ROANE: dry thin woods, escarpment of Cumberland plateau west of Rockwood, *C. A. & U. F. Weatherby 6223* (G). UNICOI: near Nolichucky River, near Erwin, *R. S. James, July 4, 1949* (UN). VAN BUREN: Falls Creek Falls State Park, *Shanks, Sharp, & Clebsch 4512* (T). WASHINGTON: white pine-hardwood forest SW. of Jonesboro, *Sharp & Shanks 7460* (T).

It is desirable, at least in Tennessee, to let var. *mollis* represent the pubescent form of *Ilex montana.* Ashe, in describing *Ilex Beadlei,* states that it is distinct from var. *mollis,* but gives no qualitative or quantitative data to show that this is true. Nor is there a disjunction in range between the two forms. It is true that as one moves further south in the United States or further east to the mountains in Tennessee, specimens examined change in character, becoming more pubescent and having a more woolly appearance on the lower leaf surface. However, in neither case is there a geographical disjunction or a distinct break in morphological characteristics. For this reason, the work of Loesener is being followed in this matter and the more pubescent form, sometimes called *Ilex Beadlei,* is treated as the extreme form of the pubescent variety of *Ilex montana.*

SUMMARY AND CONCLUSIONS

Five species of the genus *Ilex* occur in Tennessee. These are: *I. opaca,* with forma *subintegra* and forma *xanthocarpa; I. decidua; I. longipes; I. verticillata,* with var. *padifolia;* and *I. montana,*

with var. *mollis*. A new form of *I. montana*, forma *rotundifolia*, is proposed. Species limits are sometimes difficult to determine because of clines of gradation which are present between some of the species and varieties.

The study of this whole genus, in Tennessee, is now at a point where the tools of cyto-taxonomy can probably be used to advantage. With the use of such tools as these, the student should be able to arrive at solutions resolving the problems of the inter- and intra-relationships of the various species. Since the problems involved in each genus of plants are unique, so are their solutions. It is quite possible that taxonomic methods not yet used must be developed in order to understand *Ilex* satisfactorily.

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EPIPACTIS HELLEBORINE (L.) CRANTZ IN MICHIGAN, AND ITS GENERAL RANGE IN NORTH AMERICA

W. B. DREW AND R. A. GILES

IN 1933, Dr. Homer D. House published an interesting account in Torreya (Torreya 33: 133–135. 1933) concerning the spread in New York State of the orchid then known as *Serapias Helleborine* L. He showed that there had been a very considerable westward extension of its range in New York during a period of 54 years. Indeed, this adventive from the Old World is a rather exceptional plant among orchids in North America, since its biological behavior suggests an aggressiveness not commonly associated with temperate members of the Orchidaceae.

On August 16, 1940, a small colony of this orchid was discovered by Giles in moist, alluvial soil along the Red Cedar River not far from the well travelled entrance to one of the woodlots on the campus of Michigan State College in East Lansing. The colony has since been depleted because of cordwood piled upon the area during the winter and spring of 1947–1948. Moreover, *Epipactis Helleborine* competes here with a tangle of *Cynachum nigrum* (L.) Pers. under the shade of *Ptelea trifoliata* L.

Yet, despite the active competition of the other plants mentioned, and the alteration of the habitat provided by the piles of cordwood, the orchids still survive, though in lesser numbers. From all the evidence available, it seems certain that the species has been relatively recent in its arrival in East Lansing, since the late Dr. W. J. Beal, a keen student of the flora of Michigan, would have quickly observed it. So far as the writers can ascertain, this is the first record of the natural occurrence of this orchid in Michigan. There is no evidence to suggest that its occurrence in East Lansing is anything other than spontaneous.

Although this is the first report of the spontaneous occurrence of *Epipactis Helleborine* in the state, it is not the only account of its appearance in Michigan. In 1933, Dr. A. M. Fuller, Curator of the Milwaukee (Wisconsin) Public Museum, published a study of the orchids of Wisconsin in the course of which mention was made of the introduction of *Epipactis Helleborine* to Michigan. (Studies on the Flora of Wisconsin, Part I: The Orchids. Publ. Museum Milwaukee xiv (No. 1): 109. 1933.) A few years ago, Dr. Fuller kindly supplied the senior author with the interesting details of the first occurrence of the plant in Michigan. The following paragraphs, quoted from Dr. Fuller's letter, indicate the origin of the first plants of *Epipactis Helleborine* in the state:

"Mr. Ralph Ballard of Niles, Michigan, gave me the record for this plant growing at Niles, Michigan. The following paragraphs are excerpted from his letter written to me in 1931 or 1932:

"I cannot give the exact date, but it was about 1895, I think, that one of the members of the Gray Memorial Chapter of the Agassiz Association of which I was a member sent me a plant or two and some seed from Buffalo, New York. As I remember it, Miss Mathilde Schlegel, who sent the plants said the location near Buffalo where she found it was the only place in the United States where it was known to grow.

"The plants were planted in a ravine near the St. Joe River, but I think they failed to grow. Some of the seed I sowed in a little ravine on our own farm, but I failed to find any plants and, other things claiming my attention, the matter was forgotten until 1919, when we found several plants growing by the roadside in front of our house. A search in the ravine located several plants, and since then they have increased to about a hundred plants in the ravine . . .

"The plant seems to like rich clay soil and those growing by the roadside were particularly strong and vigorous."

It seems obvious that the plants eventually found by Mr. Ballard near Niles developed from the original introductions made by him in the vicinity; yet it is much less certain, though not impossible, that this colony in southwestern Michigan gave rise to the group found in East Lansing. Although Niles is

approximately 100 miles in an air-line distance from East Lansing, the prevailing southwesterly winds might have accounted for its establishment here, by transporting the light seeds. What other factors are involved in the ecesis of the orchid here, it is not possible at present to state completely. However, as Dr. House has pointed out in his paper (l. c.) an alkaline soil was found correlated with the occurrence of the plants in New York. In the East Lansing locality, the soil reaction is approximately neutral. Detailed studies would doubtless show that other factors are involved.

As to the distribution of this orchid in North America, I am indebted to the late Professor M. L. Fernald and to Dr. Donovan S. Correll for supplying me very generously with the necessary geographic data. Accordingly, *Epipactis Helleborine* is now known from the following states or provinces:

Quebec	Connecticut	Ontario	Indiana
Vermont	New York	Michigan	Missouri
New Hampshire	Pennsylvania	Wisconsin	Montana
Massachusetts	District of Columbia		

The record from Montana, according to Dr. Correll,[1] is probably that of a cultivated plant. The record from Indiana is that reported by Mr. Charles C. Deam (Flora of Indiana, p. 345 (1940)).

These facts suggest that this orchid may be reported from other adjacent mid-western states within the next few years.

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On the Nomenclature of Luzula saltuensis.—The recently developed interest in certain cytological peculiarities, including the diffuse centromere, of species of *Luzula* (Juncaceae) necessitates a critical and accurate appraisal of the taxonomy and nomenclature of the species under investigation. One of the two dozen North American species, *Luzula saltuensis* was clearly distinguished and described by M. L. Fernald in 1903 from

[1] In personal correspondence.

Orono, Maine. It is now said to occur from Newfoundland to Saskatchewan, and southward to northern Illinois[1] and Georgia. In 1938, Fernald[2] "reduced" *L. saltuensis* to a "variety" of *L. carolinae* S. Wats., and in 1944 he discarded both these species-names in favor of *L. acuminata* Raf.,[3] where he says: "It now seems that Rafinesque was nearly 40 years ahead of Watson and more than 60 ahead of me. There can be no doubt that his *L. acuminata* was *L. saltuensis*. His definition of it was good:

1447, *Luz. acuminata* Raf. repens, glabra, fol. lanceol. acum. striatis nervosis spiculis corymbosis congestis paucifloris fuscatis, calic. acum.—Boreal America, perhaps *J. pilosus* Mg. often blended with last, leaves broader and shorter, 3 uncial, stem semipedal, corymb. not exceeding the leaves, fl. small."

Although Fernald says that "there can be no doubt" that the above description applies to *L. saltuensis*, when it is compared carefully point by point with a series of specimens, there seems on the contrary to be a considerable doubt. It should be remembered that there is no type specimen of *L. acuminata*, nor are there any known specimens of any sort to support Rafinesque's description. On account of the repent basal offsets, the term "repens" might be allowed, but the plants are better described as cespitose. The leaves are certainly not wholly glabrous, unless the old leaves from the previous season are examined, and then these are seen to be much more than three inches ("3 uncial") long. If Rafinesque was describing young leaves, then the conclusion is unavoidable that they were not glabrous. The inflorescence of *L. saltuensis* is definitely not congested. It is a loose umbel with a few spreading or drooping, filiform, mostly 1-flowered branches. Finally, the statement "corymb. not exceeding the leaves," does not fit our plants, which have the inflorescences usually overtopping the leaves, and as to the item "fl. small.", *Luzula saltuensis* has the perianth as long or longer at maturity (3–4.5 mm.) than almost any other eastern American species of wood-rush.

On the basis of these evidences it seems clear that Rafinesque's brief description can scarcely be applied to the species described as *Luzula saltuensis* or *L. carolinae*. That these two binomials

[1] Jones, G. N., in Am. Midl. Nat. **31**: 251, 1944.
[2] Rhodora **40**: 404 (1938).
[3] *Op. cit.* **46**: 4 (1944).

may belong to the same species was tacitly admitted by Fernald (1938) when he says that "very evident transitions occur." Twenty years earlier, Farwell[4] described as *Juncoides pilosum* var. *michiganense* plants with the dark castaneous perianth that is supposed to be a diagnostic character of *L. carolinae*.

In the event that *Luzula saltuensis* and *L. carolinae* are eventually proved to be the same species, the latter binomial will have to prevail, but in any case the name *L. acuminata* Raf. should be rejected as a *nomen dubium*.—George Neville Jones, University of Illinois, Urbana, Illinois.

The Identity of Vinber and Vinland.—Some ethnobotanical aspects are involved in the identity of Vinland the Good. According to old Scandinavian sagas, Norsemen under the leadership of Leif Ericson and Thorfinn Karlsefni, were supposed to have come there between the years 1000 and 1006. The plants mentioned are a tree (*mösurr*), a wheat (*hveiti*) and the *vinber*, generally interpreted as the vineplant. According to Fridtjof Nansen, the quotation of wheat and vine is only a reminiscence of medieval legends. To the majority, they refer to specific plants. Old opinion holds that *vinber* could only be a vine (*Vitis*). More recently, Fernald after giving some consideration to the fact that it might have been some red currant, assumed that the vinber would more probably be the mountain cranberry (*Vaccinium Vitis-Idaea*). The latter is one of the most popular berries in Scandinavia. It is actually known under the name of *lingon* in Sweden, *tytebaer* in Norway and *raufberjalyng* in Iceland. Fernald's opinion has not been generally accepted. Leroy Andrews, Steensby and Brunn have revived the old opinion which believes it to be a vine. Both interpretations are more or less in accord with the different attempts to localize The Hop, the Norse settlement in Vinland. Vine (*Vitis*) is found on parts of the Maine coast, as well as in the St. Lawrence estuary (Steensby places The Hop at Montmagny, on the south shore, 35 miles below Quebec). If, on the contrary, vinber were *Vaccinium Vitis-Idaea*, this interpretation would agree with the various hypotheses of localization because the plant is found in

[4]Rep. Mich. Acad. Sci. **20**: 170 (1918).

Montmagny, along the coast of the baie des Chaleurs (where Bovey incidentally situates The Hop), on the southeastern coast of Nova Scotia and in different sections of the Maine coast.

The Fernald hypothesis apparently has no linguistic basis. Furthermore, according to Dr. Rolf Nordhagen (oral communication) director of the Oslo botanical garden and a brilliant ethnobotanist, as well as a taxonomist and phytogeographer, vinber is in present-day Norway, the name given to the red currant (*Ribes vulgare* or *Ribes rubrum*). There is no evidence whatsoever that the name was ever attributed to *Vaccinium Vitis-Idaea*. *Ribes vulgare* is a European species now grown in America where it frequently escapes culture. As this species cannot be implied in the Norsemen's journey, the allusion may be to some other native American species which has red berries (mainly *Ribes triste*). It could be mistaken for the European red current by the majority of travelers. Such red currants grow in all stations involved in the tentative localization of Vinland the Good. Until further study, the identification of the *vinber* in the Vinland saga as a red current appears to be the most reliable hypothesis.—Jacques Rousseau, Montreal Botanical Garden.

BIBLIOGRAPHY

Andrews, A. Leroy. 1913. Philological aspects of the plants of Wineland the good. Rhodora, **15**: 28–35.

Bovey, Wilfrid. 1936. The Vinland voyages. Mém. Soc. Roy. Can., (Ser. 3) **30** (Sect. II): 27–47.

Bruun, Daniel. 1918. The Icelandic colonization of Greenland and the finding of Vineland. Meddelelser om Grønland (København), 57: 1–228.

Fernald, M. L. 1910. Notes on the plants of Wineland the good. Rhodora, **12**: 17–38.

Rousseau, Jacques. 1937. La Botanique canadienne à l'époque de Jacques Cartier. Annales de l'ACFAS (Montréal), 3: 151–236. Also reprinted as Contrib. Lab. Bot. Univ. Montréal, No. 28, 86 pp. In the section "Les Norsemen au Vinland" (pp. 184–186, or 34–36) are discussed the different ethnobotanical aspects, as considered at that time.

Steensby, H. P. 1918. The Norsemen's route from Greenland to Wineland. Vol. of 109 pp. & 3 plates, Copenhagen (Henrik Koppels).

———. 1918. Norsemen's route from Greenland to Wineland, Meddelelser om Grønland (København), **56**: 149–202.

———. (1930) 1931. Uddrag of professor, Dr. phil. H. P. Steensby's dagbog om rejsen til "Vinland." Med bestand of Kommandor, Dr. phil. Gustav Holm, professor, Dr. phil. et litt. Finnur Johnsson og Cand. mag. Einor Storgaard udgivet ved Ad S. Jensen. Meddelelser om Grønland (København), **77**: 45–116.

A Further Note on Cercis canadensis in Connecticut.—In 1923 the late G. E. Nichols reported the occurrence of redbud (*Cercis canadensis* L.) on West Rock, a trap ridge about 400 feet high situated on the outskirts of New Haven. The plants he reported were growing in a single clump consisting of "half a dozen good-sized individuals, from half an inch to nearly two inches in diameter and up to about a dozen feet in height, together with two or three smaller plants." The entire group, Dr. Nichols stated, occupied an area of less than three feet in diameter. He concluded that the group likely originated through root suckering from a single plant.

Cercis canadensis is frequently planted as an ornamental, and since it had not been reported as occurring naturally northeast of New Jersey, Dr. Nichols at first assumed that these specimens came from a planted tree. Since West Rock Ridge is included in the New Haven Park system, this assumption seemed likely. Upon making inquiries of the superintendent of city parks, however, he was informed that no redbuds had ever been planted in the park. From the location of the station—"near the summit of a rocky ridge which has never been inhabited, and fifty feet from the nearest road, from which it is separated by a tangle of wood and thicket"—Dr. Nichols was certain that the plant was not introduced by human agencies. He concluded that these plants represented a northeastward extension in the known natural range of the species. This interpretation has apparently been accepted by subsequent workers (Hopkins 1942, Fernald 1950). In the eighth edition of Gray's Manual one finds "s. Ct. (local)" included in the natural range of *Cercis canadensis*. Aside from the West Rock station, there is apparently no other record of this species occurring naturally within the state.

In May of this year I revisited the area described by Dr. Nichols as the station for the redbud in Connecticut. A few hundred yards from the famous Judges' Cave and about 25 feet from the road is a clump of *Cercis*. The plants were in full bloom in mid-May and were readily seen from the road. The tallest plants in the clump are 12 feet in height and measure one and one-half inches in diameter at a foot above the ground. There are eight individuals measuring from half an inch to one and one-half inch in diameter, in addition to 13 small shoots

with a diameter of not more than one-fourth inch. Of the larger plants, only three have a diameter of one and one-half inches and a height of approximately twelve feet—one of these appears to be dead. The other shoots are vigorous and there was profuse bloom this year. Examination of the plants in early June, however, revealed that no fruits were developing.[1]

This clump is, I am sure, the one described by Dr. Nichols twenty-eight years ago. It seems to be in no danger of dying out and the number of plants may actually be increasing although all are apparently root suckers. As Dr. Nichols noted, there is no indication of propagation by seeds from this clump.—John R. Reeder, Osborn Botanical Laboratory, Yale University.

LITERATURE CITED

Fernald, M. L., 1950, Gray's Manual of Botany. 8 ed., *illus.* American Book Co.

Hopkins, M. 1942, Cercis in North America. Rhodora **44: 193–211.**

Nichols, G. E., 1923, Cercis canadensis in Connecticut. Rhodora **25:** 203–204.

Correll's Native Orchids of North America North of Mexico.[1]—No family of North American flowering plants has been more popular among amateur botanists than the Orchidaceae, and none of similar size (only about 150 species) can count in its literature so many independently published books, among the best known of which are Baldwin's Orchids of New England, Gibson's Our Native Orchids, Morris and Eames' Our Wild Orchids, and Niles' Bog-trotting for Orchids. In the world at large, where the orchids vie with the Compositae for the distinction of being the largest family of plants, they have long been a favorite among amateurs and professionals alike, and some of the iconographies of orchids are among the largest and most pretentious works in the whole field of botany. In this country there was no specialist in Orchidaceae until about the year 1899, when the late Oakes Ames, acting on the suggestion of N. L. Britton, took up the study of the family to which he was to devote the last half-century of his life. Provided with ample means and aided by a wife of exceptional artistic ability, he was able to build up a great orchid herbarium, to produce a long series of beautifully illustrated publications, and to surround himself with capable assistants who not only helped in his immediate work but have continued the study of orchids after leaving his botanical establishment.

One of these former assistants of Professor Ames, Dr. Donovan S. Correll, has now produced the work on North American orchids which is the subject of this notice. It is the first complete treatment of the orchids of the United States, and includes as well those of Canada, Alaska, and Greenland. Introductory notes on distribution, both regional and ecological, on general features

[1] Professor G. S. Torrey informs me that a specimen in the University of Conneticut Herbarium, collected in 1933 by E. H. Eames No. 11,521, has mature fruits with seeds.

of structure, and on cultivation are followed by a key to genera and by the methodical treatment of the genera and species which occupies the bulk of the text. The work concludes with a glossary, a list of abbreviations of authors' names with their full names and dates, a bibliography, and an index. Forty-six genera and 151 species plus a few hybrids, varieties, and forms are described. The technical generic description is followed in each case by a statement of the range and habitat of the genus and by a key to the species. The treatment of the species is very full. The accepted name, with its place of publication (as well as that of the name-bringing synonym, if any) is accompanied by a statement of the type locality (sometimes with the collector's name and other data), citation of the more important synonyms, explanation of the specific epithet, and the "common" names (many of which are obviously known only in books). A full technical description in small type, including the color of the flowers (too often omitted in scientific publications), is followed by one or more paragraphs dealing with variations, habitat, and range, and often, particularly in the case of Floridan and southwestern species, giving the data for the first record of the plant from the United States. A comparatively detailed exposition of the geographical distribution in small type is followed by cultural notes, contributed mostly by Edgar T. Wherry, but in part (for some Florida species) by J. T. Watkins. The author himself has often added a record of the original introduction of the species into cultivation, which usually took place in England. It is to be hoped that these directions for cultivation will not lead to additional inroads on our native orchids for the merely temporary decoration of backyard gardens.

In the few cases where there is opportunity for it, the information of interest is supplied on uses, as in *Vanilla*, or on the history of spread in this country, as for the only naturalized species in our flora, *Epipactis helleborine* and *Zeuxine strateumatica*.

It will be seen from this outline that the text of Correll's work is very full and satisfactory. There remains to mention the most attractive feature of this excellently organized and well-printed volume, the illustrations. Except for five plates, all of these are the work of Mrs. Oakes Ames and Gordon W. Dillon, the majority by the latter artist. All the species are represented in these beautiful drawings, usually by a figure of the whole plant as well as by floral details, in a few cases by the latter only. As an illustrator of orchids, Mr. Dillon is a worthy successor to Mrs. Ames. I must confess that I can distinguish their drawings in most cases only by the signatures.—S. F. Blake, Plant Industry Station, Beltsville, Maryland.

[1] Corell, Donovan Stewart. *Native Orchids of North America North of Mexico.* . . . with illustrations by Blanche Ames and Gordon Winston Dillon. Cultural notes contributed by Edgar Theodore Wherry and John Vertrees Watkins. Foreword by Charles Scheinfurth. xv, 399 p. incl. 7 text figures, 146 i. e. 147 plates (i. e. 154 fig.), front. 26.5 cm. (A new series of plant science books edited by Frans Verdoorn, vol. 26.) Chronica Botanica, Waltham, Mass. (also Stechert-Hafner. N. Y. City), $7.50.

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REGRESSION OF × QUERCUS DEAMII TOWARD QUERCUS MACROCARPA AND QUERCUS MUHLENBERGII[1]

H. H. Bartlett

From a genetical standpoint there is of course no reason why oak hybrids should not give true-breeding intermediates, either by segregation, which would require much time, or by doubling of the chromosome number. Before general botanists became genetically conscious there was a tradition, based upon more or less casual observations of nurserymen and others, that oak hybrids came true from seed. This was believed to be true for Bartram's oak, *Quercus heterophylla* Michx. f., from the time of Engelmann (6) until MacDougall (10) showed regression toward the parents in progenies of young seedlings. In *Quercus Rudkini* Britton, another supposed black-oak hybrid, on the contrary, he was unable to demonstrate regression to his satisfaction, although the evidence might have indicated regression toward one of the supposed parents, even if not toward the other.

The usual experience of botanists has been that hybrids are less common in Leucobalanus (the white oaks) than in Melanobalanus (the black oaks). However that may be, gradually increasing numbers of white-oak hybrids have been reported, so that many of the possible combinations are fairly well known or at least suspected to exist. The reports, by Britton and Shafer (1), Bush (2), Hampton (7), Hitchcock (8), Sargent (12; 13), Sudworth (14) and Trelease (15; 16), have not always been supported by satisfactory evidence, even though intrinsically

[1] Papers from the Department of Botany and the Botanical Gardens of the University of Michigan, no. *946*.

credible. It is the purpose of this article to show that one particular white-oak hybrid, × *Quercus Deamii*, is probably *Quercus macrocarpa* × *Q. Muhlenbergii* rather than *Q. alba* × *Q. Muhlenbergii*, as it has been reported to be, and that it shows definite regression toward the supposed parents, but whether by segregation following inbreeding or by out-crossing, or by both processes, there is no evidence.

The subject is one which has been developed by such disconnected reports over so long a time that a writer is tempted either to disregard the background entirely or to swamp a small amount of new information with a disproportionate amount of historical gleanings. Believing that the reader will find the gleanings distinctly useful, they are given as annotations of those cited publications that provide the background for what little knowledge has grown up about hybrids of our East-American oaks in general and our white oaks in particular. Observations have been quoted which have any bearing on the heredity of the peculiar long-appendaged cup scales which make up the distinctive "fringe" of *Quercus macrocarpa*, since the lack of this cup-fringe would seem to be one of the most useful criteria to look for in the search for new examples of bur-oak hybrids. The cup fringe appears to be completely or nearly recessive. Evidence will be found in publications of Bush (2), Hitchcock (8), James (9), Rehder (11), and Sargent (12). Trees with leaves resembling those of *Q. macrocarpa* (if outside the range of *Q. stellata*) but either lacking the fringe or showing it only slightly developed, should be suspected of some degree of hybridity. If possible, acorns or young seedlings should be planted in definitely recorded positions (preferably assured by gift of acorns to some Botanical Garden or Arboretum) where the trees can come to maturity without being again transplanted. The wood of *Q. macrocarpa* is as valuable as that of *Q. alba* (some consider it better) and is frequently confused with it commercially, so every hybrid progeny grown might become a contribution to the timber-tree breeding program of the future.

In 1904 the late Mr. Lent A. Williamson, of Bluffton, Indiana, and his son, Mr. E. B. Williamson, discovered a hybrid oak to which Mr. C. C. Deam subsequently devoted much study. Fertile specimens were collected by E. B. Williamson on October

9, 1904. He was even then primarily a specialist in dragon-flies, and was eventually to become a professional entomologist. The two Bluffton naturalists, Deam and E. B. Williamson, were zealous companions in field work, and since the former was the botanist, it was quite in order that the oak should have been eventually named in honor of Mr. Deam, for it was he who studied and distributed specimens and propagating material of the hybrid and requested opinions of its parentage from a number of his botanical correspondents.

George B. Sudworth, Dendrologist of the U. S. Forest Service, expressed the opinion that the hybrid was *Q. acuminata* × *alba* and the specimens were so labelled. (The name *Q. Muhlenbergii* Englem. is now accepted for *Q. acuminata* (Michx.) Sarg.) Deam (3) described the hybrid in 1911. Subsequently it was named × *Quercus Deamii* by Trelease (15; 16).

After supposedly having been cut, the original tree was rediscovered some years later. In order to secure its preservation in 1915, when it was again about to be cut, Mr. and Mrs. Deam bought the plot of land on which it stands and deeded it to the State of Indiana, which has officially designated specimen and site as the "Deam Oak Monument." The tree which is supposed to be and undoubtedly is the actual type is located about three miles northwest of Bluffton, Indiana, on State Highway 116, and in March, 1939, had a circumference of 90 inches at breast height. Since there may seem to be a possibility of doubt, in view of Deam's statement of 1911 that "an effort was made to save the tree but it was cut a few years afterward," the actual type material may be considered to be the specimens collected by Mr. E. B. Williamson Oct. 9, 1904, which were sent by Deam to the National Herbarium, the writer, and others.

A photograph of the Deam oak was used for the frontispiece of the Flora of Indiana (5). Deam commented that in 1904–5 he had made a collecting trip to Guatemala and at the request of William Trelease of the Missouri Botanical Garden collected Agave and Fourcraea for him. In recognition of this favor and without Mr. Deam's knowledge, Trelease named this tree × *Quercus Deamii*, although Mr. Deam felt that it should have been named for the Williamsons.

The tree has had three of its own nursery-grown seedlings planted about it, and there will undoubtedly be spontaneous seedlings, insuring that the living memorial to Mr. Deam will still remain after the original tree is gone. This pleasant circumstance will inform many a passer-by of Mr. Deam's life-time service to the State and to botanical science, definitively recorded in one of the best state or regional floras hitherto produced in America.

That resolving the problem of parentage of this oak was uppermost in Mr. Deam's mind at the time of its discovery is indicated by correspondence and herbarium specimens showing that he was collecting and studying one of the putative parents, the locally scarce *Q. Muhlenbergii*, at Bluffton, during the same week when Mr. Williamson collected the type material of the hybrid. No seedlings were then obtained from acorns of the latter, for Mr. Deam states in the "Flora" that the hybrid yielded *viable* acorns in 1918, 1927, and 1930. He sent one of the early seedlings (presumably from the crop of 1918) to the Botanical Gardens of the University of Michigan in April, 1926 (accession no. 9385). Later he sent acorns of the 1927 crop (accession no. 12029) from which seven seedlings were obtained, which still survive, although one is a runt which loses its few upper leaves before Fall, finishing the growing season with sprout leaves only. It has undoubtedly suffered from the competition of the three more vigorus seedlings that were planted in the same group with it. At the time of being transplanted from pots to the open garden, the seedlings did not appear any too vigorous, and, in anticipation that not all would live, they were planted in two compact groups, of four and three, respectively. Now, having reached the age of a quarter century, all but the one exceptional weakling have done well, but must now be separated to insure proper development. Inevitably they will suffer a set-back from transplanting and notes are therefore presented herewith on the older seedling and the six of the later planting which have developed normally and have foliage of adult type. These exhibit clear evidence of hybrid segregation toward one of the species which were supposed by Sudworth to be the parents, namely *Quercus Muhlenbergii*. There is no convincing evidence for *Quercus alba* having been the other parent, but, instead, *Q.*

macrocarpa Michx. is indicated. Sudworth seems to have made no reference to his opinion in print, at least not before 1917 (14).

The seedlings (aside from the weakling with only abnormal sprout foliage) fall into three groups, as will be seen by inspection of Table I. Two closely resemble Indiana material of *Q. Muhlenbergii*, but the leaves are in general too acute at the base. Otherwise they would undoubtedly, if found wild, go with that species. They differ in leaf width, and have done so consistently, growing together and nearly enough equally developed so that competition has not adversely affected either. Where the branches intermingle the leaf difference is obvious, but in a natural woodland it would probably be considered an environmental effect. Two are fairly close to the original herbarium material from the type tree of × *Q. Deamii*. Three approach *Q. macrocarpa* but do not reach the most extreme development of leaf constriction between a terminal flabelliform segment and a lobate basal segment that is shown by that species. In pure *Q. macrocarpa* the constriction, on one side at least, may reach to the midrib.

Both in the hybrids and in *Q. macrocarpa* the leaf is likely to be markedly asymmetrical, one side having a lateral lobe between the constriction and the big flabelliform end-segment. This extra lobe receives two veins, or, if only one, the latter has a strong downwardly directed branch. The flabelliform end segment of *Q. macrocarpa* may have lobes of the same sort, which are also similar to the lobes of *Q. alba*. The chestnut oaks have simple, evenly spaced teeth, sinuations, or lobes, which correspond to single, non-forked veins.

The acorns might be expected to provide striking evidence of *Q. macrocarpa* being an ancestor of × *Q. Deamii*, instead of (or in addition to) *Q. alba*. These are only beginning to be borne by the seedlings. One resembling *Q. Muhlenbergii* has non-fimbriate acorn cups, like that species. One resembling *Q. macrocarpa* is non-fimbriate, but another shows an intermediate condition, with some few of the marginal scales forming setiform appendages and others not. The fimbriate acorn-cup is characteristic of *Q. macrocarpa*, not of *Q. alba*.

Finally, it will be noted from Table I that none of the hybrids resembles *Q. alba* in having the lower surface of the leaf glabrous.

One (no. 12029–6) on the contrary, has had to be set aside from the others because of having some of the terminal leaves of the season's growth thinly pubescent above, although showing mature characteristics otherwise. Not too much importance can be given to this feature until the tree is separated from two that have greatly outgrown it, by which it is completely shaded. It appears to be genetically of very slow growth, possibly a half-dwarf. The greater persistence of pubescence on the upper leaf surface may, of course, have a genetical basis.

All of the seedlings have grown rather slowly, but the stronger ones have kept up with two seedlings of the tree, exceedingly rare in Wells County, Indiana, which Deam reported in the Flora of Indiana as *Q. macrocarpa* var. *olivaeformis* (Michx. f.) Gray. The circumferences of the seedlings both breast-high and just above the basal swelling are as follows, at the age of 25 years:

No. 12029–1: 53 cm.; 76 cm.
No. 12029–2: 29 cm.; 40.5 cm.
No. 12029–3: 26 cm.; 35.5 cm.
No. 12029–4: 45.5 cm.; 61.5 cm.
No. 12029–5: 36 cm.; 48 cm.
No. 12029–6: 23 cm.; 30 cm.

The leaf form of type material of × *Quercus Deamii* (in herb. Univ. Mich. *ex* herb. Bartlett) indicates clearly that one of the chestnut oaks was a parent (or ancestor) and this parent would reasonably seem to be *Quercus Muhlenbergii* (= *Q. acuminata*). The latter, known as sweet oak in northern Indiana, is the only chestnut oak found in Wells County. The basket oak, *Quercus Michauxii* (unfortunately, with possibility of vast confusion, it may be necessary to accept the long misapplied name *Q. Prinus* for this, as Fernald does in the current edition of Gray's Manual) is found only in the southern counties. *Quercus montana* does not extend northward even to the center of the state, and *Quercus prinoides* has been found only in one county of the northern tier. So if × *Q. Deamii* is a primary or even recent hybrid, the evidence from geographic distribution points inevitably to *Q. Muhlenbergii* as the chestnut-oak parent. This would account for the acute or subacute dentition, and likewise the narrow leaves of the most extreme segregate toward *Q. Muhlenbergii*, which is, in fact, an almost perfect match. This and at least one other seedling deviating toward *Q. Muhlenbergii*

TABLE I. Characteristics of × *Quercus Deamii*, its probable parents, *Q. Muhlenbergii* and *Q. macrocarpa*, and progeny of the type tree of the hybrid, from uncontrolled pollination, including median plants and others deviating strongly toward the supposed parents, as a result of segregation or secondary crossing.

	Leaves evenly dentate or sinuate-dentate.	Blades having some deep irregular lobes, with mere suggestion of terminal flabelliform segment.	Blades with deep constriction below terminal flabelliform segment.	Blades at maturity subglabrous to glabrous above, velutinous below	Blades at maturity soft-pubescent to glabrate above, velutinous below.	Petioles glabrous.	Petioles minutely puberulent, at least above.	Petioles thinly to conspicuously coarse-pubescent.	Persistent subulate stipules longer than terminal buds.	Bud scales subglabrous.	Bud scales ciliate and more or less pubescent.	Bud scales pilose.	Twigs of the year essentially glabrous.	Twigs of the year minutely puberulent.	Twigs of the year moderately coarse-pubescent.	Acorn cups thin-margined, not fimbriate.	Acorn cups with trace of fimbriation.	Acorn cups fimbriate.
*Q. Muhlenbergii**	+			+		+				+			+			+		
No. 12029–1	+			+		+				+			+			+		
No. 12029–2	+			+			+				+			+				
× *Q. Deamii***		+		+			+			+				+		+		
No. 9385		+		+				+	+			+			+		+	
No. 12029–3		+		+				+	+		+				+	+		
No. 12029–4			+	+				+			+				+	+		
No. 12029–5			+	+			+		+		+			+		+		
No. 12029–6			+		+			+	+			+			+			
*Q. macrocarpa****			+	+				+	+		+				+			+

* A specimen from Wells County (Deam, *s. n.*) collected on Oct. 4, 1904 for comparison with type material of the hybrid, collected a few days later by Mr. Williamson.
** Cotype of the hybrid collected Oct. 9, 1904 by E. B. Williamson (in Herb. Univ. Mich.).
*** A specimen from Ann Arbor, Michigan, collected by H. H. Bartlett (tree spontaneous in the Botanical Gardens).

are considered to have arisen by true hybrid segregation from × *Q. Deamii*, for the chestnut-oak parent is so scarce in Wells County as to make it seem hardly probable that it would have contributed the pollen for a new cross with × *Q. Deamii*. On the contrary, it would seem logical to interpret seedlings deviating toward *Q. Muhlenbergii* to be segregates rather than back-crosses.

Other seedlings, deviating toward *Quercus macrocarpa*, might logically be interpreted as new hybrids between × *Q. Deamii* and *Q. macrocarpa*, if there were any real evidence that *Q. alba* had been one of the parents of the original hybrid, but there is no such evidence. Nevertheless it must be admitted that the evidence does not conclusively rule out *Q. alba* as having been the other parent.

So far as Mr. Williamson's herbarium material of Oct. 9, 1904 indicates, the parentage of × *Q Deamii* might well have been as originally indicated. The four to six lateral lobes of the leaves, however, are actually but not conspicuously grouped above a vague constriction into a terminal flabelliform group, only a weak imitation of the condition in *Quercus macrocarpa*. There are a few duplex lobes containing two secondary veins or a single secondary with one or two downwardly directed tertiaries. Such lobes are indeed strongly characteristic of *Q. alba*, but may be found in *Q. macrocarpa* as well. Even the strong approach of seedlings to *Q. macrocarpa* need not certainly indicate that *Q. alba* was not more remotely an ancestor.

The pubescence of the hybrid and all of the seedlings cannot be held to rule out *Q. alba*. The latter is the only almost consistently glabrous white oak of the region, so it might be argued that some of the seedlings should be glabrous by segregation or back-crossing if *Q. alba* were involved. The progeny is too small for negative evidence to have any value, and might have no genetic validity anyway, in view of the fact that interacting factors for pubescence are indicated by one of the seedlings being more pubescent than any presumptive parent. So the unestablished parent of × *Q. Deamii* might as well be another markedly pubescent one, even though *Q. alba* may carry genes for pubescence which would be activated in a hybrid by interacting factors, or perhaps by dilution of the effect of inhibiting factors.

Although *Quercus alba* tends to be consistently glabrous, pubescent sprout leaves often show that factors for pubescence are present, but suppressed under the physiological conditions that result in the normal foliage of mature growth.

Among his Indiana specimens of *Quercus alba* Deam mentions only one that is pubescent. (It might be a hybrid with *Q. bicolor.*) It is on the whole not much of an argument that the small number of seedlings show none resembling *Q. alba* in having essentially glabrous leaves. Interacting factors of even two glabrous types might give pubescence. For what the argument is worth, there is one seedling of × *Q. Deamii* that has some mature leaves velutinous above as well as below. It would explain this fact most simply, in view of the close approach of some seedlings to the leaf form of *Q. macrocarpa*, and a suggestion of such form in the original hybrid, if *Q. macrocarpa* was tentatively taken to be the presumptive other parent of × *Q. Deamii*, which would then be *Q. Muhlenbergii* × *Q. macrocarpa*.

The argument, however, cannot be considered, *a priori*, as genetically sound. An isolated hybrid, primary or of a later generation, might have been so nearly self-sterile as to be only partly self-pollinated, and partly cross-pollinated by other species. So a primary hybrid *Q. Muhlenbergii* × *alba* might have set some fruits by self-pollination, and thus segregated toward the scarce or sporadically occurring *Q. Muhlenbergii*, but might at the same time have set other fruits by hybridization with *Q. macrocarpa*, producing a new hybrid resembling the latter, except in lack of the fimbriate acorn fringe, which is probably recessive or nearly so. Certainly *Quercus macrocarpa* is primarily or secondarily involved in the ancestry of those seedlings in which the leaves show the form so characteristic of the bur oak, a flabellately lobed terminal segment above a narrow constriction that occurs below the middle of the lamina and extends in extreme variates practically to the midvein.

It is to be feared that knowledge of oak genetics will grow with surpassing slowness. In the meantime, lacking precise knowledge of the parentage of hybrids, we should prefer the simplest hypotheses that seem to account for the facts. Since there is no single feature of the original tree or of the progeny of × *Quercus Deamii* that supports the hypothesis that it was *Q. Muhlenbergii*

× *Q. alba* rather than *Q. Muhlenbergii* × *Q. macrocarpa,* the latter hypothesis seems the more likely, for it explains all the known facts and is simpler. A cytological examination of the hybrids and their possible parents would perhaps throw light on the problem, without actually making the various hybrid combinations experimentally. The latter attack would be justified in view of the practical values that might come from plant breeding experiments in such a valuable group as the white oaks. Another experimental approach that is being neglected in such problems is the serological. Findings might, indeed, be negative, but differences among the proteins of such different and ancient lines of descent as those of *Q. alba, Q. Muhlenbergii* and *Q. macrocarpa* might be expected to be revealed by serological experimentation, and might help in indicating the course of evolution of plants which could not be subjected to rigorous genetical study except at altogether prohibitive expense. The white oaks, to be sure, are economically so important as to justify the attention of practical plant breeders.

The isolated hybrid oaks, to which systematists call attention, are by no means unworthy of the attention they receive. They demonstrate the possibility of wide interspecific hybridization, and the systematist cannot be unmindful of the genetic diversity between regional populations of what are considered wide-ranging species that may be caused by opportunity for hybridization in different parts of a broad range with entirely different species. Segregates from crosses and back-crosses doubtless produce blending populations that are geographically distinguishable. Some localized species may become so blended that original forms can only appear as segregates from a hybrid population. The interpretation of an aberrant or hybrid oak without experimental evidence is as difficult as guessing at the racial origin of human traits in a mixed population. The world flora, however, contains many thousands of species that are ill-adapted to genetical study. Many cannot be or never will be subjected to experimental breeding, and it will remain the obvious function of the systematist in the future as in the past to classify as best he can, making such use of genetical or other experimental findings as may seem applicable by analogy.

Annotated Bibliography

1. Britton, N. L. and Shafer, J. A. North American Trees. New York, 1908.

Here there is no discussion of white-oak hybrids but only a vague reference under *Q. alba* to a hybrid with *Q. Muhlenbergii* from Missouri and Illinois. Presumably the allusions are to Bush (2) and Sargent (12).

Reference to this work by Trelease (15) precedes the one to Deam's publication (3) and obscures Trelease's intention regarding typification of *Q. Deamii.* Although Trelease made a great point that stability of nomenclature would be assured by binomial names for hybrids, he was singularly uncritical about the designation of types. His binomial names must be typified by guess as to his intentions.

2. Bush, B. F. Hybrid oaks in western Missouri. Garden & Forest **8**: 32–33. 1895.

Reports, (1) *Q. alba* × *Q. macrocarpa* from Courtney, Jackson County, Missouri, with foliage of *Q. macrocarpa* and fruit plainly that of *Q. alba;* (2) *Q. alba* × *Q. Muhlenbergii,* clearly of the indicated parentage, but, according to Britton, "the fruit was exactly of the eastern *Q. Prinus,*" i. e., *Q. montana;* (3) *Q. alba* × *Muhlenbergii;* (4) *Q. macrocarpa* × *Q. Muhlenbergii,* from Independence, Missouri, with no fringe on the acorn cup; (5) *Q. macrocarpa* × *Q. bicolor,* several trees in a grove of *Q. bicolor* where *Q. macrocarpa* was not present. Every mention of the acorn cup verifies the other evidence that the presence of a fringe on the acorn cup is recessive.

3. Deam, Charles C. Trees of Indiana. *In,* State of Indiana, 11th Annual Report of the State Board of Forestry, 1911. Indianapolis, 1912 (pp. 86–372).

Contains the original description and drawing of the hybrid *Q. Muhlenbergii* × *macrocarpa* upon which Trelease (15; 16) is assumed to have based × *Quercus Deamii,* although he made no reference to Deam's description and cited no specimen in the earlier of the two publications (15).

4. Deam, Charles C. Trees of Indiana (First revised edition). Department of Conservation, State of Indiana (Indianapolis) 1921.

Description and illustration of *Quercus alba* × *Mulhenbergii* (× *Quercus Deamii* Trelease). "This rare hybrid . . . in 1918 bore a heavy crop of seed. A liberal quantity was sent for propagation to the Arnold Arboretum, New York Botanical Gardens, and Missouri Botanical Gardens. The Arboretum succeeded in germinating several seed. The New York Gardens succeeded in getting five seedlings. The Missouri Gardens

failed to get any to germinate. About a gallon of seeds was planted in the Clark County State forest nursery and all failed."

5. Deam, Charles C. Flora of Indiana. Department of Conservation, Division of Forestry, Indianapolis, 1940.

In addition to the information on × *Q. Deamii* Trelease, this flora has a reference to × *Q. Hillii*, of which a single Indiana tree, as reported by Sargent, was found by Hill near Roby, Indiana, and supposed to be *Q. macrocarpa* × *Q. Muhlenbergii*. Deam states: "I have a duplicate specimen but I believe it is only a specimen of the bur oak. I question the determination of this specimen because the last named parent of the hybrid does not occur there, or, if it does, is extremely rare."

6. Engelmann, George. About the oaks of the United States. Trans. St. Louis Acad. Sci. **3:** 372–384. 1876. 385–400. 1877. 539–543. 1877.

Engelmann, the most discriminating student of the oaks in his day, stated (pp. 397–398): "All the supposed hybrids are abundantly fertile . . The seedlings of such questionable individuals do not seem to revert to a supposed parent, a sport of which they might be claimed to be, but propagate the individual peculiarities of the parent; 'come true,' as the nurserymen express it. For how many generations this may continue, and whether in time forms approaching one or the other parent may not appear, remains to be seen. At the same time it is a remarkable fact, that, notwithstanding their fertility, they do not seem to propagate in their native woods; we may properly ascribe this to a lesser degree of vitality in the hybrid progeny, which causes them to be crowded out in the struggle for existence: one of the provisions of nature to keep the species distinct, or, as Dr. Gray suggests, fertilization by one of the parents may soon extinguish the hybrid characters. I find ten forms . . . which I consider as real hybrids; of them only a few, often only single individuals have become known. Their existence cannot well, without straining facts, be considered due to innate variability in the supposed parents . . . Among the White-oaks hybrids seem to be much rarer than among the Black-oaks, or it may be that they are more difficult to discover."

Engelmann's belief that the interspecific hybrid oaks "bred true" although with a greater range of variation than non-hybrids, seems to have been based upon nurserymen's experience with two black-oak hybrids. One of them, his own discovery 8 miles west of St. Louis, was *Q. imbricaria* × *Q. palustris*. He said: "It had, unfortunately, to give way to a railroad track, but ripe fruit was obtained which to Mr. Meehan of Germantown has furnished fine young plants, completely agreeing in character with the parent." The other was × *Q. heterophylla* Michx. discovered near Philadelphia by Bartram. Even in Michaux's time the original tree had been destroyed, but, as Engelmann said (p. 541) "its offspring was introduced into Europe, and the trees now seen in Bartram's

Explanation of Plates

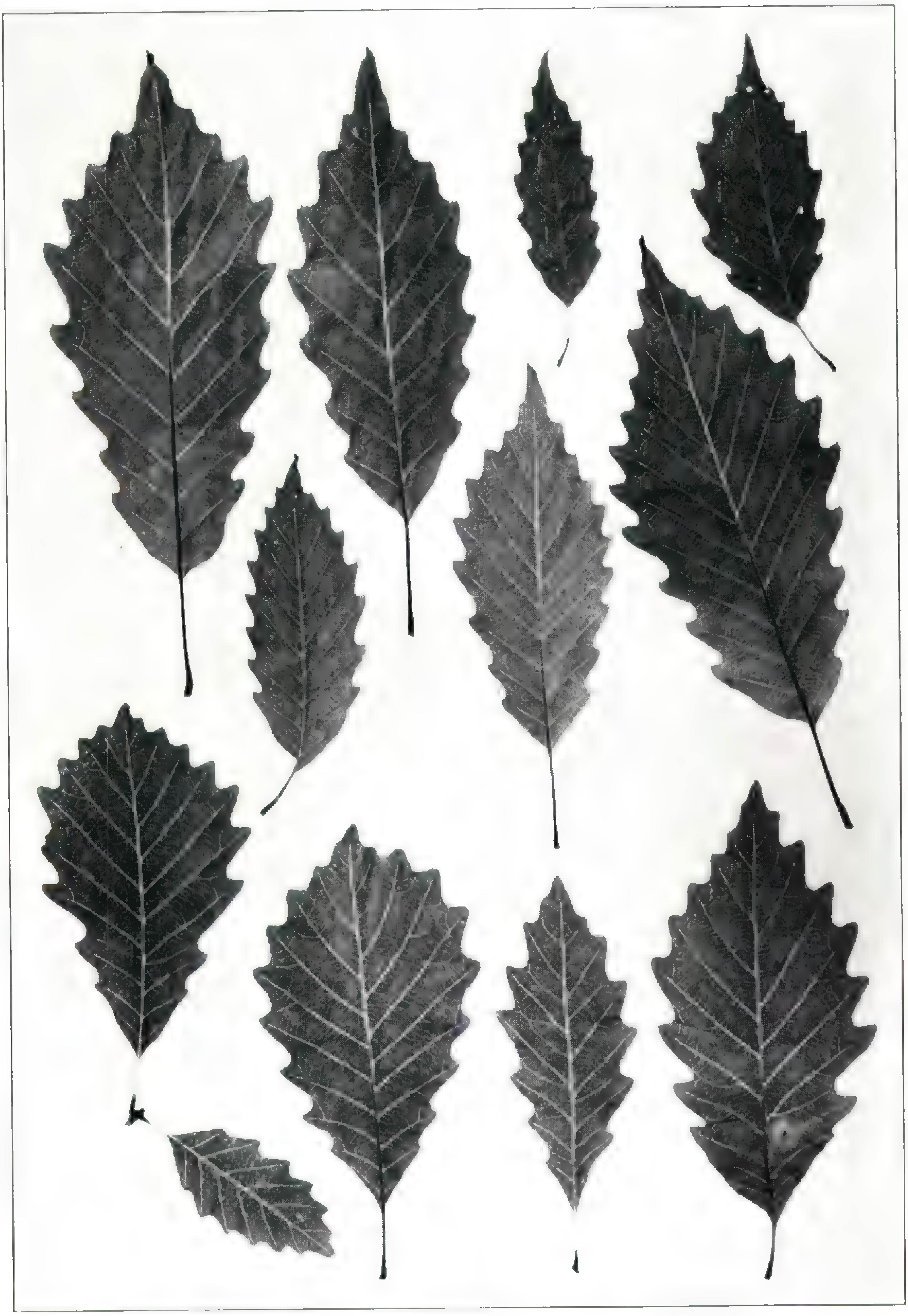
Plate 1176. Progeny of type tree of × *Quercus Deamii.* Upper 7 leaves: range of variation in the segregate most resembling *Q. Muhlenbergii* (Mich. Bot. Gard., No. 12029–1). The lateral veins have no irregularity of branching, each leading to a tooth. The acorns have no fringe, and the peduncles are less than 1 cm. long. Lower 5 leaves: the other segregate showing regression toward *Q. Muhlenbergii* (No. 12029–2). Leaves relatively broader; lateral veins with one or two upward or downward branches of irregular strength, or sometimes a fork from the midvein, directed toward the sinuses. Rarely an independent but weaker lateral vein reaches a sinus.

Plate 1177. × *Quercus Deamii.* Specimen of the original collection by E. B. Williamson, 9 Oct. 1904, from the type tree near Bluffton, Indiana (Herb. Univ. Mich.). This represents a degree of intermediacy between *Q. Muhlenbergii* and *Q. macrocarpa* that less resembles the former than do the specimens shown in Plate 1. It is perhaps nearer *Q. Muhlenbergii* than *Q. macrocarpa,* and entirely destitute of the acorn-cup fringe characteristic of the latter.

Plate 1178. Progeny of type tree of × *Quercus Deamii.* The oldest seedling (from acorn crop of 1918) at Mich. Bot. Gard. (No. 9385). The leaf form distinctly shows regression to *Q. macrophylla,* but the constriction below the flabelliform terminal part of the leaf is not deep enough to be typical. The terminal group of crenations are served by lateral veins, and the branches of the latter to the sinuses are extremely weak. The deep sinuses of the lower part of the leaf are mostly served by independent laterals, bifurcated below the sinus. The irregular deep median and lower leaf lobes are often entered by two lateral veins, which have one or two strong branches or are forked. The acorn cups are not fringed from most of the marginal scales, but only weakly from a few.

Plate 1179. Progeny of × *Quercus Deamii.* Upper 6 leaves from a seedling (No. 12029–3) showing definite regression toward *Q. macrocarpa.* Lower four leaves (from seedling no. 12029–4) show even more definite regression toward *Q. macrocarpa* but the young acorns have *no* cup fringe. For this important characteristic there is apparently independent segregation. The peduncles are about 2 cm. long.

Plate 1180. Progeny of × *Quercus Deamii.* Upper 3 leaves (no. 12029–5) show forms which would indicate complete regression of the hybrid to *Q. macrocarpa* if it were not for the contradictory characteristics of the acorn. The young acorn cup lacks a fringe, and thus resembles that of *Q. Muhlenbergii.* The peduncles range from 2 to 16 mm. in length. Lower 4 leaves: the smallest of the seedlings, perhaps a half-dwarf, showing pronounced resemblance in leaf form to *Q. macrocarpa,* but a greater tendency to retain velutinous pubescence on the upper leaf surface. This may possibly be a juvenile characteristic retained because of shading and suppression of growth by companion trees in the same group.



garden in West Philadelphia, at Marshall's place in Marshalltown, and in J. Hoopes' garden in Westchester, as well as those of the European gardens at Verrière, Herrnhausen and Prague, the latter fertile, are believed to be its seedlings. Only within the last ten or fifteen years the tree has been rediscovered, and now numbers of individuals are known in low woods on both sides of the Delaware below Philadelphia . . . often in groups together, probably the offspring of some few original hybrid trees."

7. Hampton, W. C. Descriptive list of the oaks of Hardin County, Ohio. *In* First Annual Report, Ohio State Forestry Bureau . . . for 1885. Columbus, 1886 (pp. 193–195).

Contains brief and amateurish but nevertheless significant descriptions of several newly proposed oaks which botanists have generally disregarded, most of them varieties of *Q. macrocarpa*. Under var. *monstrosa* we find an interesting comment: "Some specimens have the mossy filaments incurved as in *Q. Fisherii* [which he described as *macrocarpa* var. *Fisherii*]; this is evidently a hybrid of *Q. macrocarpa* with some other oak, perhaps *Q. lyrata*, which may have existed here at some former period."

8. Hitchcock, A. S. Another hybrid oak. Bot. Gaz. **18:** 110–111. 1893.

The original description of the hybrid *Q. macrocarpa* × *Muhlenbergii* Hitchcock, which was binomially named × *Q. Hillii* Trelease, as a *nomen nudum* in 1917 (15) and effectively in 1924 (16), the name indicating Hill's specimen from Roby, Indiana, as the type, rather than Hitchcock's from Manhattan, Kansas. The latter was indicated originally as *Q. macrocarpa* × *prinoides* var. *Muhlenbergii* because Hitchcock did not believe that *Q. Muhlenbergii* could be distinguished specifically from *Q. prinoides* in Kansas. Hitchcock made no reference to Hill, and believed his record of the hybrid to be the first. The parentage was attributed with certainty, for only two kinds of white oaks (except the rare hybrid, of which two trees were found) grow near Manhattan. One of the two had acorn cups "showing a tendency to be mossy fringed" (but very obscurely so, according to the plate) whereas the other had them "decidedly mossy fringed, as in *Q. macrocarpa*." Both may have been segregates or back-crosses of the original hybrid.

9. James, J. F. On the variability of the acorns of *Quercus macrocarpa* Michx. Journ. Cincinnati Soc. Nat. Hist. **4:** 320–322, 1 pl. 1881.

James called attention to the fact that no other East-American oak (he studied them especially around Cincinnati) has the scales at the edge of the acorn cup prolonged as thread-like appendages, forming a fringe. He regarded the fringe as possibly a new characteristic in the evolution of oak species, pointing to its extreme variability, but disregarded species

with fringed cups which occur in Asia and Europe, which of course vitiates his argument. It seems, from the facts that the fringe appendages are suppressed in the original × *Q. Deamii*, do not show in the seedlings deviating toward *Q. Muhlenbergii*, and are only very feebly developed in one of the two seedlings thus far fertile that deviate towards *Q. macrocarpa*, that the development of the fringe is inhibited by some factor contributed by *Q. Muhlenbergii* which is not linked with the chief factors for leaf form. James thought that *Q. macrocarpa* might possibly demonstrate evolution of a new group of species differing partially in varying expression of the fringe, from none at all to a very conspicuous one. Of course the individuals that he considered as *Q. macrocarpa* without fringe may have been of hybrid origin, or may even have been forms of *Q. lyrata* misidentified. In this connection it is interesting to observe that × *Q. Bebbiana* (= *Q. macrocarpa* × *alba* Engelm.) is described as having fruits similar to those of *Q. bicolor*, which presumably means that the fringe is suppressed. Rehder (11) says definitely "cup scarcely fringed." Still, the conception of the fringe as a new departure in evolution is an intriguing one. If it should prove to be recessive in all first-generation hybrids between *Q. macrocarpa* and other species, its suppression may afford a good criterion for the recognition of hybrids. If the original tree of × *Q. Deamii* is a first generation hybrid, then the fringe is recessive in at least this one combination. Whether the seedlings that deviate toward *Q. macrocarpa* are segregates or back-crosses, some gametic combinations have complete and others almost complete suppression of the fringe.

10. MacDougall, D. T. Hybridization of wild plants. Bot. Gaz. **43:** 45–58. 1907.

MacDougall had three cultures totalling over 100 seedlings of × *Quercus Rudkini* Britton (reputed to be *Q. marilandica* × *Q. Phellos*) under observation for a year. They were grown from three parents selected for their dissimilarity. The three progenies were fairly identical. Although a wide range of variability was found, it "did not exceed the limits of similar fluctuations offered by other species of oaks which are known to be unified hereditary strains." On the contrary his cultures of *Quercus heterophylla* which inadequate early tests had apparently shown to breed true, showed a wide range of segregation from *Quercus Phellos* to *Q. rubra* (in the more familiar sense, i. e., *Q. borealis* var. *maxima*, not *Q. falcata*).

11. Rehder, Alfred. Manual of Cultivated Trees and Shrubs. New York, 1934.

Of × *Quercus Schuettei* Trel. (*Q. bicolor* × *macrocarpa*) he says: "cup sometimes short-fringed," from which one is presumably to infer that sometimes it is not fringed at all.

12. Sargent, C. S. Silva of North America, Vol. VIII. Boston & New York, 1895.

Sargent recognized three hybrids involving *Q. macrocarpa*, as follows:

Q. macrocarpa × *alba* (= *Q. Bebbiana* Schneider)
Q. macrocarpa × *Muhlenbergii* (= *Q. Hillii* Trel.)
Q. macrocarpa × *bicolor* (= *Q. Schuettei* Trel.)

As to acorn fringe, the first tree of *Q. Bebbiana*, discovered by M. S. Bebb near Fountaindale, Ill., appears to have had none. Another specimen of the same, found at Athens, Ill., by Elihu Hall, was "destitute of marginal, fringe-like scales." A third, found by C. G. Pringle at Charlotte, Vermont, had good acorns, and a progeny was grown at the Arnold Arboretum. In the original tree "the cups were entirely destitute of marginal fringe."

13. Sargent, C. S. Manual of the Trees of North America (exclusive of Mexico). 2d ed. Boston & New York, 1922.

"× *Quercus Deamii* Trel. with characters intermediate between those of *Q. alba* and *Q. Muhlenbergii* and evidently a hybrid of these species, is growing near Bluffton, Wells County, Indiana."

"× *Quercus Hillii* Trel., believed to be a hybrid of *Quercus macrocarpa* and *Q. Muhlenbergii*, has been found at Roby, Lake County, Indiana, and near Independence, Jackson County, Missouri."

14. Sudworth, G. B. Hybrid oaks. Amer. Forestry 23: 683–685. 1917.

Mr. Sudworth came to the conclusion soon after the discovery of the Deam oak that it was *Q. acuminata* (= *Q. Muhlenbergii*) × *Q. alba*, but, curiously enough, does not refer to it in this article which contains "a list of the hybrid oaks discovered in the United States during the last hundred years." He remarked: "The determination of what parent species of oaks have produced the various hybrids now known is a matter entirely of recognizing the distinguishing characteristics of the parents as exhibited in the hybrid. No one is prepared to prove the supposed parentage of any of the hybrid oaks . . . So far, no one appears to have tried artificially to reproduce any of these hybrid forms by cross-fertilization of their supposed parents." (*Q. Comptonae* Sarg. might have been mentioned as an exception. This spontaneous hybrid was duplicated by Ness through pollination of *Q. virginiana* by *Q. lyrata*.)

15. Trelease, Wm. Naming American hybrid oaks. Proc. Amer. Phil. Soc. 56: 44–52. 1917.

Trelease justified giving binomial names to the oak hybrids as follows: "A binomial applied to a hybrid at once falls under the procedure customary with ordinary specific binomials, and no matter what changes the

trivial names of the parent species may undergo its own applicability rests solely on the basis of priority." Accordingly Trelease here gives binomial names to all the better attested American hybrid oaks, mostly (as in the instances of *Q. Deamii* and *Q. Hillii*) without descriptions, reference to previous literature, or citation of specimens. Actual valid establishment of most of the new names in this article would date, in event of any question of priority arising, from the following work of 1924.

16. Trelease, Wm. The American Oaks. Mem. Nat. Acad. Sci. XX. Washington, 1924.

In his key to the *Albae* which indicates the characteristics of some of the other known or supposed hybrids with *Q. alba*, × *Q. Deamii* is not included. Instead it is placed with the chestnut oaks (Prinoideae). × *Q. Hillii* is to be found in the key to the Macrocarpae, (p. 107) but Trelease apparently doubts the parentage, for he refers to it as a "supposed hybrid" between *Q. macrocarpa* and *Q. Muehlenbergii*. (Incidentally, he insists upon preserving the "e" that Engelmann put into Muhlenberg's name to represent the umlaut u, although Muhlenberg himself spelled his name with no umlaut. It would appear that the commonly accepted spelling, with u instead of ue, should continue to be preferred.)

SPECIES NEWLY OR RARELY REPORTED FROM NOVA SCOTIA AND CAPE BRETON ISLAND

D. S. Erskine

The publication of Roland's "Flora of Nova Scotia" in 1944–5, by providing a point of reference, and the funds made available for research in the brief interval between "outbreaks of mutual defence," have recently given impetus to the botanical exploration of this province. Most of the collections reported were made in connection with a forest ecology survey, financed by the Nova Scotia Research Foundation, by successive summer parties of students led by Dr. E. C. Smith of Acadia University. Collections made by the same parties on Brier Island with Dr. A. E. Roland are to be reported elsewhere. Also excluded are some collections of introduced plants as yet uncertainly identified.

Although the following records are based primarily on the specimens in the Acadia University herbarium,[1] these in some cases are duplicates of collections which were made for other

[1] Thanks are expressed to the members of the Biology Department for making this collection freely available.

botanical institutions. I wish to thank Dr. Roland for reading the manuscript while it was being prepared and for the records based on his collections made for the herbarium of the Agricultural College at Debert; Dr. W. G. Dore, for placing at my disposal unpublished notes on grasses, based on his and Eville Gorham's collections made for the herbarium of the Dominion Experimental Farm at Ottawa; Dr. H. P. Bell, for looking up in the Dalhousie University herbarium the data for certain records; and Miss M. S. Brown, for permission to report her recent discoveries. I am indebted to Dr. Smith and to J. S. Erskine for their continuing advice and collaboration.

Asplenium viride Huds. Cumberland Co.: rock crevices, two miles above Jeffers Falls Crossroads, *C. J. Bishop & I. V. Hall*, July 1, 1949. This collection would seem to reinstate MacKay's old record from Moose River, Cumberland Co., and confirms its presence on the mainland of the province. A third Cape Breton collection may be added to the fifty-year old records of Macoun and C. B. Robinson, also in Inverness Co.: mossy cliffs below the waterfall, south branch of Grand Anse Brook, Pleasant Bay, *E. C. Smith, D. S. Erskine, D. R. Sampson & F. C. Bent 4056.*

Woodwardia virginica (L.) Sm. Inverness Co.: very abundant in sphagnum-black spruce swamp, West Lake Ainslie, *E. C. Smith, D. S. Erskine, E. H. Collins & W. B. Schofield 1191*[2]; *E. C. Smith, E. H. Collins, J. M. Bruce, D. R. Sampson & F. C. Bent 3856.* The northeastern range-limit of this species is extended from Pictou to Cape Breton Island. The following collection in the herbarium of Dr. G. C. Warren (recently donated to Acadia University)—Prince Edward Island: Southport, Queens Co., *Smallwood*, Sept. 1903—confirms Roland's report from that province (Proc. N. S. Inst. Sci. *20* (3): 77), omitted from the range given in his Flora and in the eighth edition of Gray's Manual.

Potamogeton amplifolius Tuckerm. Inverness Co.: slow water, Au Coin Brook, Cheticamp, *SECS 1149.* Local range extended northeastward in the province from Kings Co. to Cape Breton.

P. praelongus Wulf. Inverness Co.: Pembroke Lake, *D. A. Livingstone*, Aug. 22, 1949. This is the first Cape Breton station for this species, which has, according to Dr. Roland, been found abundant at the one old station (MacKay's in Earltown Lakes) by various recent collectors, and occurs also in Kings Co.: Cornwallis River above Kentville, *J. P. Kelsall*, June 1946.

Sagittaria latifolia Willd. Inverness Co.: pond behind beach, Margaree Harbour, *SECS 1146.* The northeastern range-limit is extended to Cape Breton by this collection of the forma *gracilis* (Pursh) Robinson.

Sagittaria cuneata Sheldon. Inverness Co.: muddy pond edge, Cheticamp, *E. C. Smith, E. H. Collins, J. M. Bruce & D. R. Sampson 2777;* muddy shallows of garbage-strewn lake, Le Grand Lac, Grand Etang, *D. A. Livingstone*, Aug. 22, 1949; in brook near beach, Margaree Harbour, *SECS 1145;* upright in mud, stream at Hayes River, *SCBSB 3891*, leaves floating, *3892;*

[2] Collections of the forest ecology party of 1948 are subsequently designated by the initials *SECS*, the collections of 1949 by *SCBS*, and those of 1950, *SCBSB*.

Victoria Co.; muddy borders of pond, South Gut St. Ann's, *SECS 894*. The northeastern limit is extended from Pictou to Cape Breton, where this seems the common species of the genus.

Elodea canadensis Michx. (*Anacharis* Planch.) Colchester Co.: in an artificial pond, Debert, *SECS 136*. This first station for the province was discovered and indicated to us by Dr. Roland. Since the pond is frequented by waterfowl and a prospective sanctuary, it seems possible that this recent introduction was intentional or accompanied an unsuccessful introduction of wild rice.

Briza media L. Hants Co.: abundantly naturalized in grass around Kings College School, Windsor, *D. S. Erskine*, June 18, 1951. The only previous report from the province was Macoun's from Digby forty years ago. The new Manual does not indicate the naturalization of this species in the Maritime Provinces.

Lolium multiflorum Lam. Halifax Co.: ballast, Halifax, *E. Gorham 45. 1319B*. "The Italian rye-grass, which differs from *L. perenne* in the presence of awns on the lemmas and in the rolled leaves, was collected in admixture with the latter on ballast at Halifax. This adds another species to the introduced grass flora of Nova Scotia"—Dore, ms.

Deschampsia cespitosa (L.) Beauv., var. **parviflora** (Thuill.) Richter. Colchester Co.: by railroad tracks, Stewiacke, *A. E. Roland & W. G. Dore 45.1003;* Pictou Co.: by fair grounds, New Glasgow, *W. G. Dore & E. Gorham 45.459*. "This variety is a European plant introduced in certain localities in New England, but not formerly reported for Canada. It is so different from our native var. *glauca* (Hartm.) Lindm. in its tall stature, ample panicle and basal tufts of stiff coarse leaves that it is readily separated. It grows in dry open sites by towns and cities rather than on the moist gravelly shores of lakes and streams, which further marks it as adventive. The three widely separated points where it was collected in 1945 represent independent introductions (a third station was found at Saint John, N. B., *W. G. Dore & E. Gorham 45.933*)"—W. G. Dore, ms.

Calamagrostis neglecta (Ehrh.) Gaertn., Mey. & Scherb. (det. W. G. Dore) Victoria Co.: larch bog, Big Baddeck, *SECS 1059*. This collection, first from Cape Breton, is the third from the province, the second being that reported from Beaver Lake, Yarmouth Co., by Louis-Marie in Rhodora *46:* 297–8. 1944.

Agrostis canina L. Pictou Co.: old field near New Glasgow, *H. A. Senn, W. G. Dore & E. Gorham 45.476;* a report for Halifax Co.: Prospect Road (Dore, in litt.). Since the presence of this species on the mainland was not indicated by Dore and Roland (Proc. N. S. Inst. Sci. *20* (4): 247. 1942), it seems desirable to include it in this paper. With the typical plants at New Glasgow collections were also made from clones lacking purple coloration, a form for which Dore finds the name var. *varians* Asch. & Graebn. available (*Senn, Dore & Gorham 45.477*).

Alopecurus aequalis Sobol. (*A. aristulatus* Michx.) Inverness Co.: pond edge, Kenloch (Strathlorne Station), *SECS 1195*. Although reported from Margaree Harbour by Roland (Can. Field Nat. *52:* 106. 1938), no Cape Breton stations are shown on the distribution map in Dore and Roland's Grasses.

Muhlenbergia glomerata (Willd.) Trin. Inverness Co.: bog, Loch Ban, Lake Ainslie, *M. S. Brown*, Aug. 15, 1944 (more or less typical); bog at head of MacGregor Brook, North Aspy River, *SECS 1163* (var. *cinnoides* (Link)

Hermann, det. W. G. Dore). As appears from the distribution map in Dore and Roland's Grasses (p. 256, sub *M. racemosa*), and from Dore's annotation on our collection, these constitute the first report from Cape Breton Island.

Zizania aquatica L., var. **interior** Fassett. Kings Co.: established in the Canard River, Canard, *A. E. Roland & W. G. Dore 3078*, Aug. 11. 1942. It has persisted at this station since then, and probably since the 1939 collection reported by Roland in RHODORA *43:* 338. 1941. This variety, which Fassett states does not range east of Indiana, was also established along the tidal banks of the Saint John River at Sheffield, N. B. (*W. G. Dore 2218*). "Both these are probably artificial establishments resulting from the attempts of sportsmen to encourage its growth to attract wildfowl"—Dore, ms. The var. *angustifolia* Hitchc. appears to have been introduced at the Long Lake station near Amherst, and has been found similarly at Port Hood, Inverness Co.—Dore, in litt.

Cyperus filiculmis Vahl. Antigonish Co.: sand behind beach, Pomquet, *W. G. Dore 1585*, July 20. 1940. An extension of range from Maine if, as seems likely, these immature plants belong to the var. *macilentus* Fern.

Carex prairea Dewey. (*C. diandra*, var. *ramosa* (Boott) Fern.). Kings Co.: in standing water of *Typha* swamp, Centreville, *David Erskine 938.*

C. atratiformis Britton. Victoria Co.: rock crevices, Salmon River, *SCBS 2653.* A relatively northern species, new to the province.

C. capillaris L., var. **major** Blytt. Inverness Co.: crevices in rock cliff, South Blair River, *SCBSB 3798.* Widely distributed in New Brunswick, but new to Nova Scotia.

C. livida (Wahl.) Willd., var. **Grayana** (Dewey) Fern. Richmond Co.: bog by Point Michaud road, *SECS 771.* This new collection from the same general area as the Louisburg report of Macoun appears to reinstate the species in the flora of Nova Scotia.

C. plantaginea Lam. Colchester Co.: hardwood hillside, Brookside, *A. E. Roland* May 20, June 20, 1951. This spring-flowering sedge has been reported for the Maritimes only from western New Brunswick.

C. hystricina Muhl. Kings Co.: swale along brook, North Mountain above Delhaven, *David Erskine 742;* Arlington, *G. C. Warren*, June 8, 1944; abundant in swamp north of Cornwallis River, Cambridge, *W. B. Schofield 56.* Nova Scotian records were needed to complete the range of this species in eastern Canada. In his Flora, Roland reports *C. lurida*, var. *gracilis* (Boott) Bailey as present in central Nova Scotia; from the description this may well refer to *C. hystricina.*

Lemna trisulca L. Inverness Co.: shallow water in cat-tail marsh by bridge, Scotsville, *A. E. Roland 686*, Aug. 25, 1950; Victoria Co.: slow-flowing stream, Baddeck Bridge, *SECS 1041.* These are the first collections from Cape Breton Island, but constitute only a slight eastward extension of range from Prince Edward Island and the Magdalens.

Juncus compressus Jacq. Inverness Co.: bog, North East Mabou, *SCBS 2817;* Richmond Co.: poorly drained sand by canal, St. Peter's, *A. E. Roland 666*, Sept. 8, 1950. These new records from the province are the first from Cape Breton, Rousseau's from Guysborough being the one previous, and the stations are, on the whole, consistent with the restriction of its eastern range in Canada to the Gulf of St. Lawrence area.

J. Dudleyi Wieg. Inverness Co.: wet meadow, Cheticamp, *SCBSB 3668.* New to Cape Breton, but found in Prince Edward Island. The only Nova Scotian record is of Long's collection from Middleton.

J. stygius L., var. **americanus** Buchenau. Inverness Co.: bog at head of MacGregor Brook, North Aspy River, *SCBS 2768*. The only collection known to Roland was Allen's from Isle Madame, made seventy years ago.

Luzula parviflora (Ehrh.) Desv., var. **melanocarpa** (Michx.) Buchenau. Cumberland Co.: woods road, Three Sisters, *SCBSB 3132*, new to mainland Nova Scotia and intermediate between the Strait of Canso and New Brunswick, an apparent gap in the ranges of several species which could perhaps be filled in for others—as it has been for *Solidago macrophylla* Pursh, collected at Moose Lake, Colchester Co., (*Smith, Collins & Schofield 1208*).

Sisyrinchium angustifolium Mill., sensu Fern. (*S. graminoides* Bickn.) Richmond Co.: wet gravelly border of McIntyre's Lake, *A. E. Roland 669*, Sept. 8, 1950. Although scattered from Yarmouth to Guysborough Co., this species has not been reported from Cape Breton.

Habenaria flava (L.) R. Br., var. **herbiola** (R. Br.) Ames & Correll. Annapolis Co.: field, Kemp's farm, Middleton, *Eric Hockey*, July 10, 1938; Kings Co.: low ground by river, Gaspereau, *J. S. & D. Erskine 160;* Inverness Co.: Cheticamp, *SCBSB 3650*. Hitherto known in Nova Scotia only by one collection from Guysborough Co., this variety seems to be general though local in the northern counties.

Scleranthus annuus L., listed by Roland as one to be expected in Nova Scotia, was reported by H. Groh in Canadian Weed Survey, Fourth Report, 1945, p. 14, from Kings Co.: Waterville (coll. Buchanan, 1940); since collected from the railroad at Windsor, Hants Co.: *J. S. Erskine 50.991* (in Provincial Museum of Science).

Stellaria Holostea L. Kings Co.: field below road, Starrs Point, *J. S. Erskine*, June 3, 1951. This seems rather a rare introduction, being the first record for the Maritime Provinces.

S. humifusa Rottb. Guysborough Co.: salt meadow, Marie Joseph, *SECS 625*. This seems to be the first station on the Nova Scotian mainland.

Brasenia Schreberi Gmel. Victoria Co.: pond, Middle Aspy River, Cape North, *SECS 1083*. This first Cape Breton Station seems to be the northeastern range limit of the species.

Ranunculus sceleratus L. Halifax Co.: damp roadside, Barrie Beach, *H. P. Bell*, July 18, 1935; *Jean W. McLellan*, July 21, 1937; sand beside brackish pond, Eastern Passage, *J. S. Erskine*, July 13, 1949; *H. P. Bell, A. Gorham, & J. S. Erskine*, July 21, 1949 (Station discovered by *M. S. Brown*). Although reported for the Nova Scotian flora in the eighth edition of Gray's Manual, this species was not included in Roland's Flora. It is also found along the coast in New Brunswick.

Anemone canadensis L. Victoria Co.: meadow, Bay St. Lawrence, *SCBS 2720;* Inverness Co.: meadow at end of pond, Presqu'ile, *SCBSB 3368;* meadow, Cheticamp, *SCBSB 3658*. The presence of this species in Nova Scotia was indicated in the eighth edition of Gray's Manual, though omitted from Roland's Flora.

Tillaea aquatica L. Cape Breton Co.: muddy pond behind beach, Cataloge, *SCBS 2853*, the third collection from the province and the first from Cape Breton.

Parnassia parviflora DC. Inverness Co.: damp grassy hollows in sand dunes, West Mabou Harbour, *SCBSB 3906*. The rediscovery of this species, so long on the books for Cape Breton, was one major excitement of last summer's collecting.

Sanguisorba canadensis L. Kings Co.: moist meadow, Scott's Bay, *J. S. Erskine*, Aug. 15, 1947, a recent collection from the Nova Scotian mainland, but perhaps, as Roland suggests for the previous ones, an introduction, for so conspicuous a plant could scarcely have been overlooked by M. E. Eaton who collected there in 1938.

Robinia hispida L. Kings Co.: south of Wolfville, *L. A. West, J. Wesley & R. Harlow*, Sept. 1943. An unreported introduction, unlikely to spread far, but still persistent on the bank opposite the College's University Avenue dump.

Empetrum atropurpureum Fern. & Wieg. (det. E. C. Smith). Inverness Co.: in mats along edge of sea-bluff, Pleasant Bay, *SECS 947; SCBS 2762; SCBSB 3983*, with *E. nigrum;* Victoria Co.: sheltered edges of exposure barren, seven miles west of Neil's Harbour on "Mary Ann Trail," *SCBSB 3825*. At this station the equally rare *E. Eamesii* was also collected, from hummocks in the barren, *SCBSB 3808*. *E. atropurpureum* is new to Cape Breton, and was collected in the province only by Macoun.

Floerkea proserpinacoides Willd. Inverness Co.: forming carpets in ravine hardwoods, Glenora, Mabou Highlands, *E. C. Smith, D. S. Erskine, D. R. Sampson & F. C. Bent 4016*. This station, first for Cape Breton and second for the province (see Rhodora *50:* 283. 1948), removed any possible doubt of the indigenous status of Floerkea in Nova Scotia, despite the distance beyond its generally ascribed northeastern limits.

Ilex glabra (L.) Gray. Cape Breton Co.: bog, Louisburg, *G. C. Warren*, July 28, 1938. A northeastward extension of range from Halifax to Cape Breton Island.

Hypericum majus (Gray) Britton. Victoria Co.: mossy woods road, Big Baddeck, *SECS 1065*. Some plants of the collection suggest an admixture of *H. canadense.*

Epilobium hirsutum L. Halifax Co.: beside Steele's Pond, Point Pleasant, Halifax, *J. S. Erskine*, Aug. 1, 1949. An introduced species as yet unreported from the Maritimes.

E. strictum Muhl. Antigonish Co. (so given; but apparently just across the line in Guysborough Co.): swamp three miles south of Merland, *SECS 662;* Kings Co.: swamp by main road, Hortonville, *David Erskine 757;* marsh, Habitant Creek, Sheffield Mills, *H. P. Bell, A. Gorham, J. S. Erskine, & D. Erskine*, July 14, 1950. This species, known from the Tantramar Marshes and common in Cape Breton, may now be reinstated in the mainland flora of the province.

Oenothera biennis L., var. **hirsutissima** Gray. Kings Co.: sand at foot of cliff, Starrs Point, *David Erskine 493*. A specimen from Guysborough Co.: beach, Cooks Cove, *H. G. Perry, R. H. Wetmore, G. C. Hicks & A. R. Prince 10223*, seems to belong here also. From Fernald's treatment of the subgenus *Onagra*, it would appear that *Oe. biennis*, not *Oe. muricata* which is a synonym of *Oe. parviflora* L., is the "common evening primrose" of Nova Scotia. He there reports this variety for the other Maritime Provinces only.

Zizia aurea (L.) Koch. Antigonish Co.: roadside along Pomquet River, *SCBSB 3173;* Halifax Co.: bank of stream, above Upper Musquodoboit, *SESB 4128*. An extension of range from New Brunswick.

Pimpinella Sagifraga L. Yarmouth Co.: weed, locally abundant, Pubnico, *A. E. Roland & D. Palfrey 703*, Sept. 15, 1950. For this report, first from Nova Scotia although it has long been known from the middle St. John River valley in New Brunswick, I am indebted to Dr. Roland.

Vaccinium caespitosum Michx. Kings Co.: rocky cliffs, Black River, *R. H. Wetmore*, June 12, 1920. Newly reported for the province. To M. E. Eaton goes the credit for first recognizing this specimen as a *Vaccinium*. The Prest (1905) record of *V. uliginosum* from barrens in the western and northern counties of Nova Scotia, mentioned by Roland, may well apply to this second species of the subgenus *Euvaccinium*. It is, at any rate, abundant in the Black River area, where we sought it after seeing specimens in the herbarium.

Teucrium canadense L. Richmond Co.: a patch by the bridge to Isle Madame, *A. E. Roland*, Sept. 8, 1950. This is the first record from Cape Breton, although the species was already known from both the north and south shores of the Nova Scotian mainland. The gap from Queens Co. to Richmond Co. is broken by the following collection: Halifax Co.: barrier beach, Queensland, St. Margarets Bay, *David Erskine 866*.

Origanum vulgare L. Hants Co.: covering a considerable area along the Wentworth Road, a mile west of Sweets Corner, *J. S. Erskine*, Sept. 17, 1949; *SCBSB 3998*. At this station it set no fruit and is spreading vegetatively only; first record of its establishment in the Maritimes.

Lycopus europaeus L. Halifax Co.: edge of ballast dump, Steele's Pond, Point Pleasant, Halifax, *J. S. Erskine & David Erskine*, Aug. 24, 1949. An adventive species very similar to *L. americanus*, newly recorded for the Maritimes.

Verbascum virgatum Stokes. Cape Breton Co.: in a cemetery, Sydney, *G. C. Warren*, July 1946. From the same county as Macoun's sole record, this collection indicates presence, though probably not persistence, of this species.

Cymbalaria muralis Gaertn., Mey., & Scherb. Yarmouth Co.: shady roadside, Vancouver Street, Yarmouth, *Claire Killam*, Sept. 2, 1948. This is the first report of the establishment of this introduction in Nova Scotia.

Linaria repens (L.) Mill. Kings Co.: orchard back of laundry, Acadia University, Wolfville, *L. Annis & I. MacDonald*, Oct. 13, 1944. The eighth edition of Gray's Manual settled the identification of these specimens, resolving a conflict in our concept of *L. canadensis* and providing us with a species new to Nova Scotia.

L. dalmatica (L.) Mill. Halifax Co.: roadside ditch, Hubbards, *J. S. Erskine & David Erskine 855*. We took the only specimen; therefore this second record (first from the provincial mainland see Fernald 1948) can scarcely be regarded as that of an established species.

Penstemon Digitalis (Sweet) Nutt. Kings Co.: north side of run-out field, top of Cape Blomidon, *Wilbert Spencer & Murray Zinck*, July 26, 1936. The extension of range of this species northeastward to Nova Scotia is in keeping with its weedy behavior.

Plantago indica L. (*P. arenaria* Waldst. & Kit.). Halifax Co.: railway yard, Halifax, *M. S. Brown*, Aug. 1950. The specimen, determined by Dr. Roland, and now in the Agricultural College herbarium at Debert, seems to represent the first introduction of this species to the Maritime Provinces.

Solidago hispida Muhl. Digby Co.: Sandy Cove, *R. Erskine*, Aug. 8, 1948. No stations are recorded in Roland's Flora of Nova Scotia, his one specimen having been lost in the fire.

Cotula coronopifolia L. Halifax Co.: salt marsh by sea, Prospect, *M. S. Brown*, Sept. 17, 1938; edge of brackish pond, beach at Eastern Passage, *J. S. Erskine*, July 13, 1949, *H. P. Bell, A. Gorham, & J. S. Erskine*, July 21, 1949. Known for fifty years from Prince Edward Island, and more recently collected

in New Brunswick on Grand Manan and at Lower Caraquet, Gloucester Co. (*W. G. Dore & E. Gorham, 45. 790*). This cosmopolitan species of muddy coasts was added to the flora of Nova Scotia by *M. S. Brown's* discovery of these stations.

Prenanthes racemosa Michx. Digby Co.: cliff-edge, Sandy Cove, *R. Erskine*, Aug. 8, 1948. This is the first collection of the species from the Nova Scotian mainland, but Macoun had reported it from Sydney Mines in Cape Breton.

WOLFVILLE, NOVA SCOTIA

NEW ZEALAND BOTANISTS[1]—On December 5, 1642, Abel Janszoon Tasman left Anthony van Dieman's Land for the islands of Solomon. Instead of his destination thirteen days later he reached what he named Staten Land, later changed to Nova Zeelandia. But it was not for two hundred more years that New Zealand was botanically explored beyond the fringes of her three principal islands. In fact, it was not until 1853-55 that J. D. Hooker's *Flora Novae-Zealandiae* was published, the first tabulation of the plant life. Of the total of 1571 vascular plants known in 1925, three-fourths are peculiar to the islands. 366 native species are common to other regions, chiefly Australia, but 108 species are common to South America and New Zealand. How this distinctive flora was made known is the theme of this attractive little volume.

The botanical exploration of New Zealand began Friday, October 8, 1769, when Cook landed at Poverty Bay—named because of the disappointing flora that the party encountered there. For the next seventy years reconnaissance was made by the British, French and American governments climaxing with the colonization by the British in 1840. In the first period of New Zealand's botanical history were visits by Allan and Richard Cunningham, Ernst Dieffenbach, John Carne Bidwell, and briefer visits by Archibald Menzies, Dumont D'Urville, Charles Darwin, etc. Each of these explorers in Miss Glenn's book is characterized more, however, by his discoveries than by his personality. This impersonal quality is, perhaps, the weakest thread in the fabric of her writing. Put aside the book and it is hard to recall a bit of anecdote that high-lighted more than one or two of the nearly thirty persons accounted for.

It is easier to personalize the figures that fall in the second period of botanical exploration or the last one hundred and ten years. Here appear such familiar figures as J. D. Hooker, who came on the *Erebus* as surgeon and naturalist, just as Dr. David Lyall served on the companion ship, the *Terror*, to chart the "Southern Ocean" and investigate terrestrial magnetism. From Hooker and Lyall's exploration of the main Auckland and Campbell islands came the material for Hooker's classic *Flora Antarctica* (1844); illustrated with 80 plates and describing 100 species, it is notable that the collections for this work were made in less than a month! Foremost resident botanist was Rev. William Colenso, who came in 1834 in time to guide Darwin the following year when he visited the islands on the voyage of the *Beagle*. Dr. Andrew Sinclair, surgeon with the H. M. S. *Sulphur*, which visited the coast of Lower California, reached New Zealand in 1841. Sinclair collected particularly on North Island and sent fine sets of plants to Kew. Unfortunately he was

[1] *Botanical explorers of New Zealand*. By Rewa Glenn. A. H. & A. W. Reed, Wellington, N. Z., pp. 176, *6 plates, frontispiece in color*, 1950. 13s. 2d.

drowned in 1861 when fording the Rangitata River before he published any important paper on the island flora. Then follow David Monro, physician, sheep rancher, magistrate, who was knighted by Queen Victoria; W. T. L. Travers, Lieutenant, barrister, and his son Henry, both field collectors; the geologist Julius von Haast, who named the Franz Josef Glacier and for whom Hooker named the cushion composite genus *Haastia* of the "Southern Alps." James Hector, geologist in both Canada and New Zealand, and director of the New Zealand Institute, falls in this period. Better known to us is the forester Thomas Kirk, author of the *Forest Flora of New Zealand*, lecturer at Wellington College and the principal writer on forestry in the islands. Foremost of New Zealand botanists for field exploration and for the extent of his writings is Leonard Cockayne. Finally there is the museum curator, founder of a field naturalists' club, and author of the comprehensive *Manual of the New Zealand Flora* (ed. 2, 1925), T. F. Cheeseman. These essentially contemporary figures are more fully characterized from family sources.

The book is without any documentation but is indexed; in fact the index reads like Lloyd's register of British ships: *Acheron, Alligator, Asiatic, Aurora, Bangalore, Beagle, Bengal Merchant, Betsy, Bounty, Buffalo, Chatham, Clio, County of Carnavon, Cuba, Discovery*, on to *Terror, Tory*, and *Virago!* Scented names they are full blown down the winds of history.—JOSEPH EWAN, TULANE UNIVERSITY, NEW ORLEANS.

WOLFFIA COLUMBIANA IN METHUEN, MASSACHUSETTS.—While botanizing along the Merrimack River in Methuen on November 4, 1951, the pool at the mouth of Sawyer Brook was found to be covered by a mixture of *Lemna minor* L. and *Wolffia columbiana* Karst. Wolffia was not found at the mouth of Griffin Brook, a short distance upstream, or at the mouth of Bartlett Brook, a short distance downstream, although conditions were similar. Additional specimens were collected by Mr. Bean on November 11. Specimens will be deposited in the herbaria of the New England Botanical Club, Boston University, and the Peabody Museum of Salem.

Wolffia columbiana seems to be either a rare plant or a rarely collected species in New England. R. J. Eaton[1] mentions Lake Champlain; three localities in Connecticut; and two in Massachusetts, a collection made in Holyoke by W. E. Manning in 1933 and one made by Eaton in Concord in 1938. The Flora of Connecticut lists five additional localities in that state. Our station is the third record for Massachusetts, the first record for Essex County, and this note possibly sets a record for promptness of publication.—STUART K. HARRIS AND RALPH C. BEAN.

[1] Eaton, R. J. 1939. Wolffia columbiana in Concord, Massachusetts. RHODORA **41**: 42, 43.

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PLATE 1181. Black-drink ceremony of the Florida Indians. From a print first published by Teodore de Brys in a "*Brevis narratis eorum quae in Florida Americae.*" Frankfort. 1591.

Rhodora

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THE NEW ENGLAND BOTANICAL CLUB

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STUDIES OF EARLY SPECIMENS AND REPORTS OF ILEX VOMITORIA

A. H. G. Alston[1] and Richard Evans Schultes[2]

A recent paper (Schultes in Bot. Mus. Leafl. Harvard Univ. 14 (1950) 97–105) has discussed the correct name of the yaupon, pointing out the reasons why *Ilex vomitoria* is the valid binomial for the species of holly which was the source of the famous "black drink," the ceremonial emetic used by the Indians of the southeastern part of the United States until about the beginning of the nineteenth century. In this article, reference was made to several pre-Linnaean names and citations, but it was not found necessary to enter into a general consideration of the early collections in order to review the taxonomic and nomenclatorial history of the plant since 1753.

The notes and observations which we present in the following pages outline the results of our study of certain classical and early collections of *Ilex vomitoria*, upon which were based authentic and often-quoted reports of the use of the plant amongst the aborigines. It is hoped that these notes may contribute to our understanding of the ethnobotanical history of this caffeine-bearing holly as well as afford further clarification of certain technical points in the early nomenclatorial and taxonomic studies of the plant.

We have been fortunate in finding a wealth of pre-Linnaean material preserved in the British Museum (Natural History) to

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[2] Botanist, Bureau of Plant Industry, Soils, and Agricultural Engineering, United States Department of Agriculture; Research Fellow, Botanical Museum, Harvard University.

the officers of which institution we are grateful for permission to examine the collections in question.

The earliest "description of the source of the emetic and stimulant drink of the Indians of Florida can be found in the account of the purification ceremony written down by Nuñez Cabeça de Vaca (Relación y comentarios . . .)" and published in 1542. A facsimile of the page bearing this earliest report was recently published (Schultes: loc. cit. t. 24). The drink, it was stated, was prepared from the leaves of trees resembling the live-oak ("las hojas de los árboles como de enzina . . ."). It should be noted that no common or native name for the plant was reported. No specimens are known to have been collected by this early expedition, even though numerous references were made to the plants and animals of the new lands.

The earliest use of the native name *cassine* in reference to the plant appears to be in the report of Narváez, who, in 1536, met with the drink amongst the Indians along the coast of Texas. In writing of the drink and of its uses, Narváez states (Hakluyt: "Principal Navigations Voyages Traffiques and Discoveries of the English Nation" 8 (1904) 454):

> "Afterwards he [the tribal leader] commandeth Cassine to be brewed, which is a drinke made of the leaves of a certaine tree. They drinke this cassine very hotte; he drinketh first, then causeth to be given thereof to all of them one after another in the same boule . . .
> Moreover, this drinke hath such a vertue, that as soone as they have drunke it, they become all in a sweate, which sweate being past, it taketh away hunger and thirst for four and twenty houres after."

Although Narváez gave no description of the source of the drink beyond stating that it was made from the "leaves of a certaine tree," his account is noteworthy because it is apparently the earliest use of the native name in connection with the plant, and the often-quoted report of the great hunger-and thirst-allaying properties was here set forth for the first time.

De Laudonnière, who led a Huguenot expedition to Florida in 1564, found the same ceremonial emetic in use amongst the Indians of the St. Johns River. His chronicler, Le Moyne, wrote ("Indorum Floridam provinciam inhabitantium eicones . . ." (1591) t. 29) that the drink, which was referred to as *cassine*, was made "from the leaves from a certain root." He gives no further description, nor were specimens gathered and

preserved for posterity. It is to Le Moyne, however, that we are indebted for a charming drawing of the ceremonial quaffing of the black drink during an Indian council (plate 1181).

From this extremely meagre knowledge of the source of a beverage for which such astounding properties were claimed and around the use of which such curious ceremonies had grown up, there was little advance for nearly two centuries. Even Bauhin, when he published his "Pinax" ((1623) 170), had no specimen at hand and was unable to describe or name the plant. He merely stated in this book: "Casina herba e cujus succo potionem coficiunt in Florida, quam bibunt in locum periculosum se conferunt, quo famen e sitim per horas 24 tollunt; para 2, Amer. navig. 4." This was repeated by Bauhin and Cherler in 1651 in their "Historia plantarum universalis" (3 (1651) 631), but still no description was offered. A. P. de Candolle's index of the Bauhin Herbarium at Basle (Bull. Herb. Boissier, ser. 2, 4 (1904) 752) listed only *Ilex Aquifolium*, so it is probable that Bauhin had never seen the plant and that his entire report was based on Narváez's account.

The earliest illustration of *Ilex vomitoria* which we have discovered is that published by Leonard Plukenet in 1705. A description of the plant in question was offered by Plukenet in 1700: "*Cassine vera Floridanorum Arbuscula baccifera Alaterni ferme facie, foliis alternatim sitis, tetrapyrene*" (Almagesti Botanici Mantissa (1700) 40). This description was followed by an illustration five years later ("Amaltheum Botanicum" 4 (1705) t. 376, f. 2). We have examined the Plukenet collection preserved in the Sloane Herbarium at the British Museum (Natural History) and find two specimens of *Ilex vomitoria;* one in Herb. Sloane No. 93 (p. 87); the other in Herb. Sloane No. 87 (p. 85). The latter specimen is a small fragment; the former is a good branching sprig from which, it is at once obvious, the Plukenet illustration was made. The illustration is an exact copy, published in reverse, of the sprig. Furthermore, this specimen is labelled, in Plukenet's own writing, with a statement that it represented "T.376, f.2", so this may be considered to be his personal testimony as to the source of the drawing.

In Plukenet's own copy of "Almagestum Botanicum" (1691), preserved in the library of the British Museum, there is a margi-

nal insert, in Plukenet's hand, on page 90 (between *Castanea sativa* and *Catsjan-Panel*) of the entire discussion and description of Cassine vera *Floridana* . . . which was later incorporated in the 1700 edition of "Almagesti Botanici . . ." Therefore, the earliest real botanical description based upon a specimen to which we may refer to-day was published in 1700, the first illustration, based upon an herbarium specimen, dated from 1705[3].

It is of great interest to note here that in the "Amaltheum Botanicum," in which volume the illustration of *Cassine vera Floridana* was published, there is no reference whatsoever to the plant in the text and that in the text reference to "Cassine vera Floridana" (or *Ilex vomitoria*) in the "Almagesti Botanici Mantissa," no reference whatsoever is made to the use of the plant in preparing a drink. There is, however, in the text of this volume a note which states that "Cassine altera *Floridana*, folio Alaterni *Hysicanensis* aemulo . . ." was used to make a drink like tea and which appears nearly equal in its powers ("e foliis hujus arboris potum Theae similem, & viribus fere parem, conficere dicuntur"). For this plant, Plukenet refers to t. 377, f. 4. The figure is an exact drawing of a specimen mounted on page 87 of the Sloane Herbarium Book No. 93, directly opposite the species of *Ilex vomitoria* and is referable to *I. Cassine* L., the dahoon holly. This is of the utmost significance, inasmuch as it is the first reliable botanical evidence that *Ilex Cassine* L., a species very distinct from *I. vomitoria* (one synonym of which is *I. Cassine* Walt., as discussed in Schultes loc. cit. 98), was used in making a tea-beverage. It must be borne in mind, however, that Plukenet did not state that this was the source of the *ceremonial emetic* which the Indians, from remote times, had employed in their councils.

There remains to discuss a curious occurrence in Plukenet's Almagesti Botanici when he refers to [*Ilex vomitoria* or] *Cassine vera Floridanorum*, with some doubt, a Cretan plant— "Abelicea s. Santalus adulterina." Plukenet's reference is to Bauhin's "Historia plantarium universalis" (1650) 490, which, in turn, was taken from Clusius' "Rariorum plantarum historia" (1601)

[3] These dates were given as 1691 and 1692, respectively, in Schultes: Bot. Mus. Leafl. Harvard Univ. 14 (1950) 99.

cccij. This plant, now called *Zelkova cretica* Spach, belongs to the *Urticaceae* and has, of course, nothing to do with *Ilex vomitoria.* He likewise reported as being the same as his "Cassine vera Floridanorum" the "Pseudosantalus Cretica abolicea dicta" on the basis of a drawing in Parkinson's "Theatrum Botanicum" cap. xlviii (1640); this plant likewise is referable to *Zelkova cretica.*

Petiver, an apothecary who lived from 1658 to 1718, amassed in London extremely interesting collections of plants, several sets of which are preserved in the Sloane Herbarium at the British Museum. An examination of these sets has revealed several points of interest. In the set included in the Sloane Herbarium Book No. 178 F. 10, there is a specimen numbered 19 and labelled "the true *Cassine* or *Carolina* Tea." Although Petiver's notes state that he believes it to be the same as the "yaupon" which, with its use by the Indians, Lawson described in his Natural History of Carolina (1718) 90, the specimen is definitely not *Ilex vomitoria.*

The name Carolina tea may, at that time, equally well have been applied to the aromatic *Symplocos tinctoria* (L.) L'Her., as shown by the specimen corresponding to Number 485 "*Thea* Caroliniana *Lauro Cerasi* fol." (Petiver: Mus. Petiver (1695) 42). The original label of the collector (Mr. Robert Rutherford, Surgeon) states: "Lawrell or Bayes bear a yellow flower in March and smell exceeding sweet." To this, Petiver has added, in his own handwriting, "Thea Caroliniana, MP485."

The specimen (Number 19) which Petiver has called "true Cassine" is a species of *Viburnum.* The leaves might be said superficially to resemble those of *Ilex vomitoria,* but that it cannot be an *Ilex* is attested by the regularly opposite placement of the leaves. There is, however, one separated leaf which is very defin tely referable to *Ilex vomitoria* and which is mounted on the page next and very close to the sprig of *Viburnum,* so that there can be very little doubt that some confusion has occurred.

The specimen mounted next to this so-called "true Cassine"—Number 20—is likewise a *Viburnum* and can be referred rather definitely to *V. cassinoides.* This Petiver has called "Bitter Cassine or Cassio-berry Bush. Cassine Caroliniana, Arbuti folio," and he has further written that "this differs from the last

[i. e. Number 19] in having much larger and deeper notcht leaves, growing opposite." This very definite statement would lead us to believe that specimen Number 19 did *not* have opposite leaves, in which case we are, we believe, justified in assuming that the sprig of *Viburnum* with opposite leaves was inserted in Number 19 wrongly. Coupling this reasoning with the presence in one of the several Petiver sets at the British Museum of one leaf which is unquestionably of *Ilex vomitoria* under Number 19, we are encouraged to believe that an error has been committed.

In both the Petiver and Plukenet collections in the Sloane Herbarium, specimens of *Viburnum* have been mounted in close proximity to specimens of *Ilex vomitoria.* Sometimes they have been annotated as "another kind of Cassine" and, as we have seen, in several Petiver collections, even a twig of a *Viburnum* has been substituted, through error, in the place for *Ilex vomitoria.* This combination of circumstances might easily lead us to one of several conclusions: (1) the herbalists were trying to indicate merely a similarity between the *Viburnum* and the *Ilex* which, in the field, could attract attention or be the source of erroneous reports; or (2) they might have been suggesting (although they never state so) that a species of *Viburnum* was used together with the *Ilex vomitoria* or in its place.

In connection with the possible use of a *Viburnum* in preparing the black drink, it may be relevant to refer to a statement by Rafinesque (Med. Fl. 1, p. 9), who wrote that the weak infusion of the leaves of the "true casseena" are

> ". . . useful in stomach fevers, diabetes, small-pox, etc. as a mild emetic, but the Indians *black drink* is a strong concoction of them, and a violent, though harmless, vomitive. In North Carolina, the inhabitants of the sea side swamps, having no good water to drink, purify it by boiling it with a little casseena (perhaps *Viburnum cassinoides*) and use it constantly warm, as the Chinese do their daily tea. *I. Dahoon* and *I. Cassine* are used as substitutes for the casseena, and many other shrubs appear to be used indiscriminately for making the black drink: for example, the *Cassine ramulosa*[4] of the *Flora of Louisiana.* The use made of the leaves in Carolina or Florida by the native Indians has given rise to the opinion that this species was the Paraguay tea mentioned in Martyn's *Miller*, on the authority of M. Frazier; but the species which produces that article is the *I. paraguariensis* Lam. *I. vomitoria* is not very common in British collections. . ."

[4] A mere synonym of *Ilex vomitoria*.

This passage would, at first reading, give one the impression that perhaps many plants entered into the preparation of the black drink. Closer study, however, reveals a deep confusion in Rafinesque's mind. First, he says that casseena is perhaps *Viburnum cassinoides;* whether this is based on actual observation in the field or upon the suggestiveness of the specific epithet is not clear. Then, secondly, he states that *Ilex Cassine* L. (*I. Dahoon* Walt.) and *I. vomitoria* (*I. Cassine* Walt.) are used as substitutes for the casseena. Furthermore, thirdly, he speaks of "many other shrubs" which are used indiscriminately, and, as an example, he cites a *synonym* of *Ilex vomitoria!* In view of this uncertainty and of the general confusion characteristic of much of Rafinesque's work, we believe that this report of the use of numerous species in the manufacture of the black drink cannot be taken too seriously. We have considered it in detail here inasmuch as apparently most of the present reports which attribute the source of the cassine tea to several or more plants stem directly from Rafinesque's passage.

In none of the old collections and reports which we have examined is there reliable and directly stated evidence that any plant other than *Ilex vomitoria* was the widely employed source of the black drink. Not even the closely allied *Ilex Cassine* L. or dahoon can be pointed to as a possible source. As has been shown (Schultes, loc. cit.), endless confusion and uncertainty has resulted from the unfortunate application of the specific epithet *Cassine* by Linnaeus to a plant which is not the cassine but the dahoon and from the application of the same specific epithet shortly thereafter to the true cassine. Most chemical analyses which have been made are of extremely limited value since we cannot be certain whether the name "Ilex Cassine," which the chemists use to identify their material, refers to the cassine or to the dahoon. The only chemical studies of apparently accurately-determined material seem to be those of Power and Chestnut (in Journ. Amer. Chem. Soc. 41 (1919) 1307), who were cognizant of the nomenclatoral confusion surrounding the binomial "*Ilex Cassine*" and who definitely state (l. c. 1308) that "the *Ilex Cassine* of Walter (but not of Linné) is the *Ilex vomitoria* Aiton, and, as we have shown, it is only the species to which the latter name is now assigned which contains caffeine."

A POPULATION STUDY OF THE VARIATION IN THE INFLORESCENCE OF SPIRAEA TOMENTOSA

Peter J. Salamun

Introduction

In the Atlantic States and on the Coastal Plain the "common form" of *Spiraea tomentosa* L. has been described by Fernald (1912) as having a densely-flowered panicle, with the branches mostly compound, and the follicles permanently lanate. The inland phase, var. *rosea* (Raf.) Fern., has a less crowded panicle, with simple branches, and the follicles covered with tomentum which is promptly deciduous. An investigation of these characters in local population samples (Woodson, 1947) or mass collections (Anderson, 1941) and herbarium specimens corroborates the presence of two varieties. Some additional information has been obtained concerning the nature of this variation and the distribution of the two varieties.

Morphological Characters

A preliminary examination of the material assembled indicated that some of the characters used to distinguish var. *tomentosa* and var. *rosea* are of doubtful taxonomic value. In both varities the branches are simple toward the tip, but usually possess smaller branches toward the base. Whether the follicles are lanate or tomentose also does not appear to be diagnostic, and no objective method has been devised to distinguish between these two kinds of pubescence. Similarly the deciduous nature of the tomentum cannot be readily compared. In no individual plants was the tomentum entirely lacking; some persisted even on the inflorescences of the previous year. It seems that the amount of tomentum may be correlated with the age of the follicles, but no distinct tendency could be associated with either variety.

The flowers of both varieties are predominantly rose-colored, but individuals with white flowers occasionally are found. The latter condition has been described as forma *albiflora* by Macbride (1915). It may be of interest to mention that the only

white-flowered individuals observed were herbarium specimens collected within the range of var. *tomentosa.*

The present study agrees with Professor Fernald's statement that the leaves of both var. *tomentosa* and var. *rosea* vary in outline from lanceolate to ovate-oblong, and the color of the tomentum of the lower surface ranges from white to rufous. Furthermore, the outline of the inflorescence varies from ovoid to narrowly pyramidal, with the lower branches slightly spreading to strongly ascending.

The character based on the crowding or density of the flowers or fruits on the branches of the panicle appears to be paramount, for a distinction between the two varietal entities can be made in a majority of instances by visual observation. When a more objective method is used, that of counting the number of flowers or fruits along a unit length of the inflorescence, var. *rosea* again stands out as different from var. *tomentosa.* The variation of this character is the basis for this study.

Materials and Methods

Population samples, each consisting of an inflorescence bearing either mature flowers or fruits from a number of plants selected at random, were collected from 60 different localities. Individuals were picked with maximum regard to similarity of exposure on the plants, and at a sufficient distance apart to avoid clonal duplication. In most cases 25 or more individuals comprised a sample, but in a few localities a small number of plants were observed and correspondingly smaller collections were obtained.

The paucity of samples from the Middle Atlantic States, the northern Coastal Plain, and the southern and western periphery of the range necessitated some use of herbarium material. The use of this material together with population samples will be discussed later.

In each individual plant the number of flowers or fruits was determined for a unit length of one centimeter on the spire of the inflorescence, immediately above the first lateral branch. This position was selected because of its uniform exposure on the panicle, and the ease with which the flowers or fruits could be counted without destroying the structure. If the tip of the

inflorescence was damaged or destroyed, the count was made on a lower branch. A comparison of the density at the tip of the inflorescence with that of the lower branches in a large number of individuals disclosed a difference of only one flower or fruit per centimeter.

The variation in this character of crowding in local population samples is shown in Table 1, where the number of individuals are shown in the various density classes. For example, at Reedsburg, Wisconsin, the sample consisted of 63 individual plants. In 6 of these, 6 flowers or fruits were counted along one centimeter of a branch. Similarly, 13 individuals showed counts of 7, 24 had counts of 8, 14 had counts of 9, and 6 individual inflorescences were recorded as having 10 flowers or fruits per centimeter. From these data it is apparent that the range of the individuals from any one locality does not include the entire range of variability of the species-population, but varies within smaller limits about a central tendency. It may be also mentioned that the range of variation on a single plant is usually less than that of the local population. In some plants the inflorescences of the previous year persist enabling a comparison for a two year period. No significant difference in numbers was noted in this span of time.

Arithmetic means, representing the central tendencies for the samples, were computed and are also included in Table 1. Each of these values is plotted, in whole numbers, on Map 1. The plants having a tendency for densely-flowered panicles appear to predominate in the northeast portion of the range, whereas elsewhere those with less crowded inflorescences are more conspicuous.

From New Jersey to Missouri and southward only a few population samples were collected. Since the species appears to be quite rare in this region, further observations of this character were made from herbarium specimens.

A more complete coverage of the species range was made by combining herbarium specimens and population samples in the manner described by Woodson (1947). The range of *S. tomentosa* was divided into quadrats, each 100 miles square. All of the individuals collected within the limits of each quadrat were considered members of a population sample. The arithmetic means computed for these sample areas are plotted on Map 2. The results are strikingly similar to those shown in Map 1. Iso-

TABLE 1. The density of the inflorescence in population samples (mass collections) of *Spiraea tomentosa.*

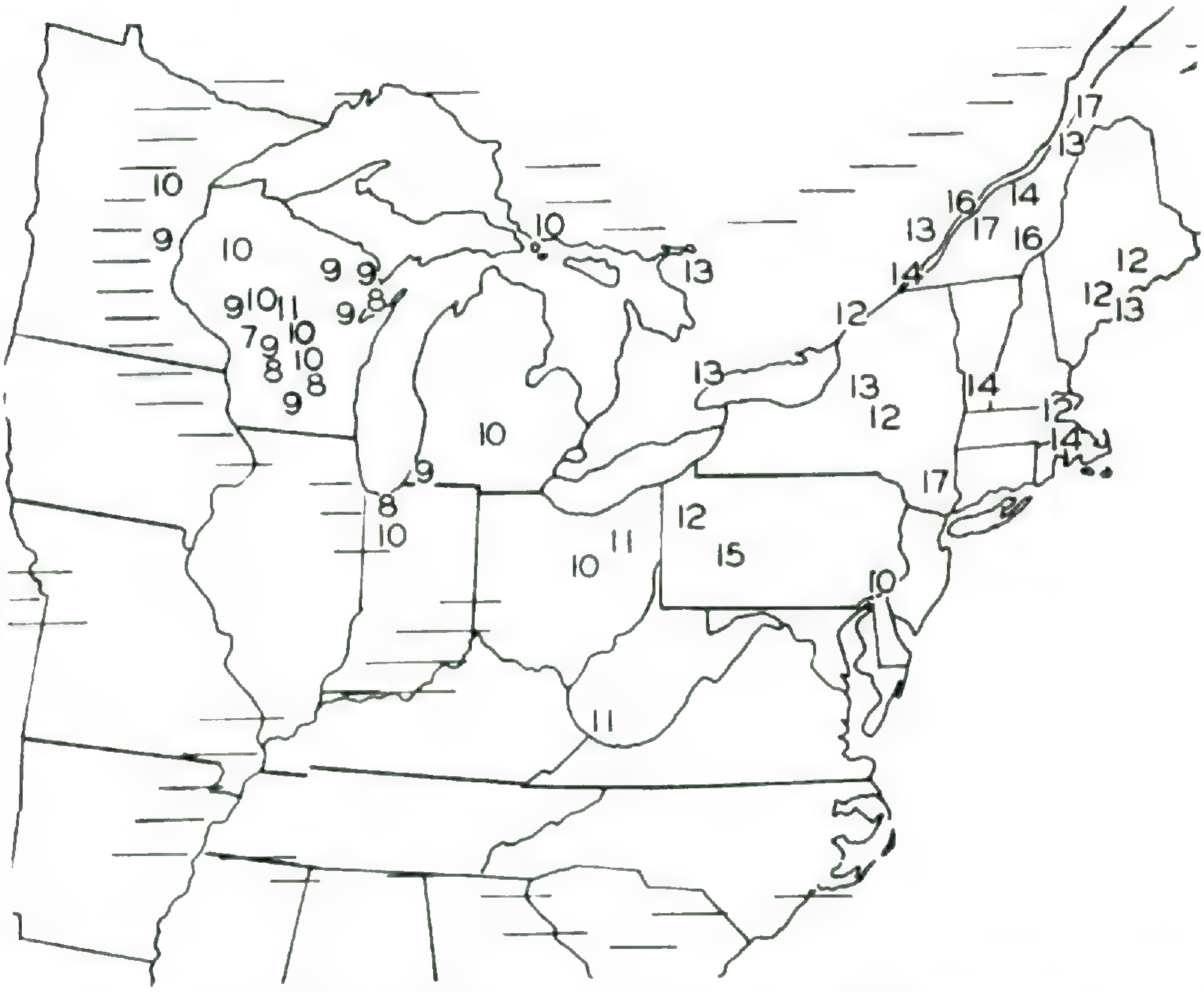
Locality	Number of flowers or fruits per centimeter																	
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	av.
WISCONSIN																		
Reedsburg	—	6	13	24	14	6	—	—	—	—	—	—	—	—	—	—	—	8.0
Hook Lake Bog	—	—	5	7	6	5	2	—	—	—	—	—	—	—	—	—	—	8.7
Millston (1)	4	11	16	9	2	—	—	—	—	—	—	—	—	—	—	—	—	6.9
Millston (2)	—	—	1	6	6	5	3	—	—	—	—	—	—	—	—	—	—	9.1
Tomah	—	2	6	7	3	2	—	—	—	—	—	—	—	—	—	—	—	7.9
Merrillan	—	—	1	11	25	20	18	1	—	—	—	—	—	—	—	—	—	9.6
Oconto	—	2	11	11	3	1	—	—	—	—	—	—	—	—	—	—	—	7.6
Sarona	—	—	—	3	9	6	2	2	—	—	—	—	—	—	—	—	—	9.6
Packwaukee	—	—	1	10	20	13	9	2	1	—	—	—	—	—	—	—	—	9.5
Mill Bluff	—	—	1	7	5	5	2	—	1	—	—	—	—	—	—	—	—	9.2
Friendship	—	—	1	9	11	13	5	1	1	—	—	—	—	—	—	—	—	9.5
Adams	—	—	—	—	4	6	1	2	—	—	—	—	—	—	—	—	—	10.1
Shawano	—	4	10	19	39	29	18	9	—	—	—	—	—	—	—	—	—	9.3
Lake Mills	—	—	—	1	3	2	1	2	1	—	—	—	—	—	—	—	—	10.3
Stanley	—	—	—	4	3	5	3	2	1	1	—	—	—	—	—	—	—	10.2
Wis. Rapids	—	—	—	7	21	16	13	10	6	1	1	—	—	—	—	—	—	10.3
Ladysmith	—	1	—	3	2	4	1	1	—	—	—	—	—	—	—	—	—	9.3
Stevens Point	—	—	—	2	4	10	9	6	3	3	—	—	—	—	—	—	—	10.9
Marinette	—	1	5	12	12	13	2	1	—	—	—	—	—	—	—	—	—	8.9
Otsego	—	—	3	5	1	1	—	—	—	—	—	—	—	—	—	—	—	8.0
Monico	1	3	4	6	5	3	1	—	—	—	—	—	—	—	—	—	—	9.0
MINNESOTA																		
Duquette	—	1	3	9	7	5	4	1	—	—	—	—	—	—	—	—	—	8.9
Nickerson	—	—	—	1	4	10	6	3	1	—	—	—	—	—	—	—	—	10.3
INDIANA																		
Enos	—	—	1	1	3	3	3	2	—	—	—	—	—	—	—	—	—	9.9
Dune Park	—	—	5	9	6	3	1	—	—	—	—	—	—	—	—	—	—	8.4
East of Gary	—	—	—	3	2	9	5	7	2	2	1	—	—	—	—	—	—	11.0

TABLE 1—(*Continued*)

Locality	Number of flowers or fruits per centimeter																	
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	av.
MICHIGAN																		
Hibbard Lake	—	—	—	5	1	3	2	—	—	—	—	—	—	—	—	—	—	9.2
Marshall	—	—	1	2	4	11	6	1	—	—	—	—	—	—	—	—	—	9.9
OHIO																		
Akron	—	—	2	5	5	6	9	4	1	1	—	1	—	—	—	—	—	10.3
Salem	—	—	—	2	2	6	3	8	1	—	2	—	—	—	—	—	—	11.1
WEST VIRGINIA																		
Clintonville	—	—	—	2	6	9	13	16	7	—	—	—	—	—	—	—	—	11.1
PENNSYLVANIA																		
Kennett	—	—	1	2	3	6	2	1	—	1	—	—	—	—	—	—	—	9.9
Harmony	—	—	—	—	3	5	11	10	9	3	2	—	—	—	—	—	—	11.8
Ingomar	—	—	—	—	—	—	1	—	4	3	4	4	1	1	2	1	—	15.3
ONTARIO																		
North Bay	—	—	1	1	6	8	1	3	—	—	—	—	—	—	—	—	—	9.8
Iron Bridge	—	—	—	5	12	15	16	12	3	2	—	—	—	—	—	—	—	10.6
Cumberland	—	—	1	2	6	9	9	9	7	1	—	—	—	—	—	—	—	10.9
Brockville	—	—	—	—	1	8	11	10	9	4	—	—	—	—	—	—	—	11.7
Huntsville	—	—	—	—	—	—	8	11	9	7	1	—	—	—	—	—	—	12.5
Hawksbury	—	—	—	1	1	7	6	11	10	12	5	3	—	—	—	—	—	12.6
Havelach	—	—	—	—	—	1	1	—	1	2	2	—	—	—	—	—	—	13.1
QUEBEC																		
Bai de Pontiac	—	—	—	1	7	12	15	11	5	1	—	—	—	—	—	—	—	11.9
Montmagny	—	—	—	—	2	3	3	1	3	6	4	2	—	2	—	—	—	13.2
St. Clotilde	—	—	—	—	1	3	5	9	17	10	8	7	3	1	—	—	—	13.5
Victoriaville	—	—	—	—	—	1	4	4	5	6	4	3	—	1	—	—	—	13.5
St. Jovite	—	—	—	—	—	2	7	10	16	14	13	8	1	1	—	—	—	13.6
Lancaster	—	—	—	—	1	—	—	2	3	3	4	2	1	—	—	—	—	13.9
Disraeli	—	—	—	—	—	—	2	5	8	10	11	10	15	10	7	2	—	15.7
Dalesville	—	—	—	—	—	—	—	—	9	12	15	14	14	7	3	1	—	15.7

TABLE 1—*Concluded*

Locality	Number of flowers or fruits per centimeter																	
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	av.
QUEBEC—(*Continued*)																		
Bon Conseil	—	—	—	—	—	—	—	1	7	7	14	19	22	16	5	4	4	16.5
Cap St. Ignace	—	—	—	—	—	—	—	—	2	11	16	19	12	13	8	6	4	16.7
MAINE																		
Norridewalk	—	—	—	—	2	2	8	13	8	2	2	—	—	—	—	—	—	12.0
Medomak	—	—	—	—	1	3	4	8	3	4	2	—	1	—	—	—	—	12.3
Boothbay Harbor	—	—	—	—	—	9	19	29	48	24	23	9	2	—	—	—	—	13.1
MASSACHUSETTS																		
Bedford	—	—	—	—	2	8	11	16	11	8	4	1	—	—	—	—	—	12.2
Lancaster	—	—	—	—	—	1	1	2	3	6	4	2	—	—	—	—	—	13.7
NEW YORK																		
Waterville	—	—	—	—	1	8	7	17	10	10	15	—	—	—	—	—	—	12.3
Malone	—	—	—	—	—	—	2	11	13	12	9	1	—	—	—	—	—	13.4
Port Jervis	—	—	—	—	—	—	—	—	—	5	8	9	15	7	4	2	—	16.6
VERMONT																		
West Dover	—	—	—	—	—	1	4	—	2	—	3	4	2	1	—	—	—	14.2



MAP. 1. Average number of flowers or fruits per centimeter in population samples of *S. tomentosa*. Lined regions represent the approximate limits of the species as plotted by Gille (1949). Not all Wisconsin localities could be included. Base map reproduction by permission of McKnight & McKnight Publishing Company.

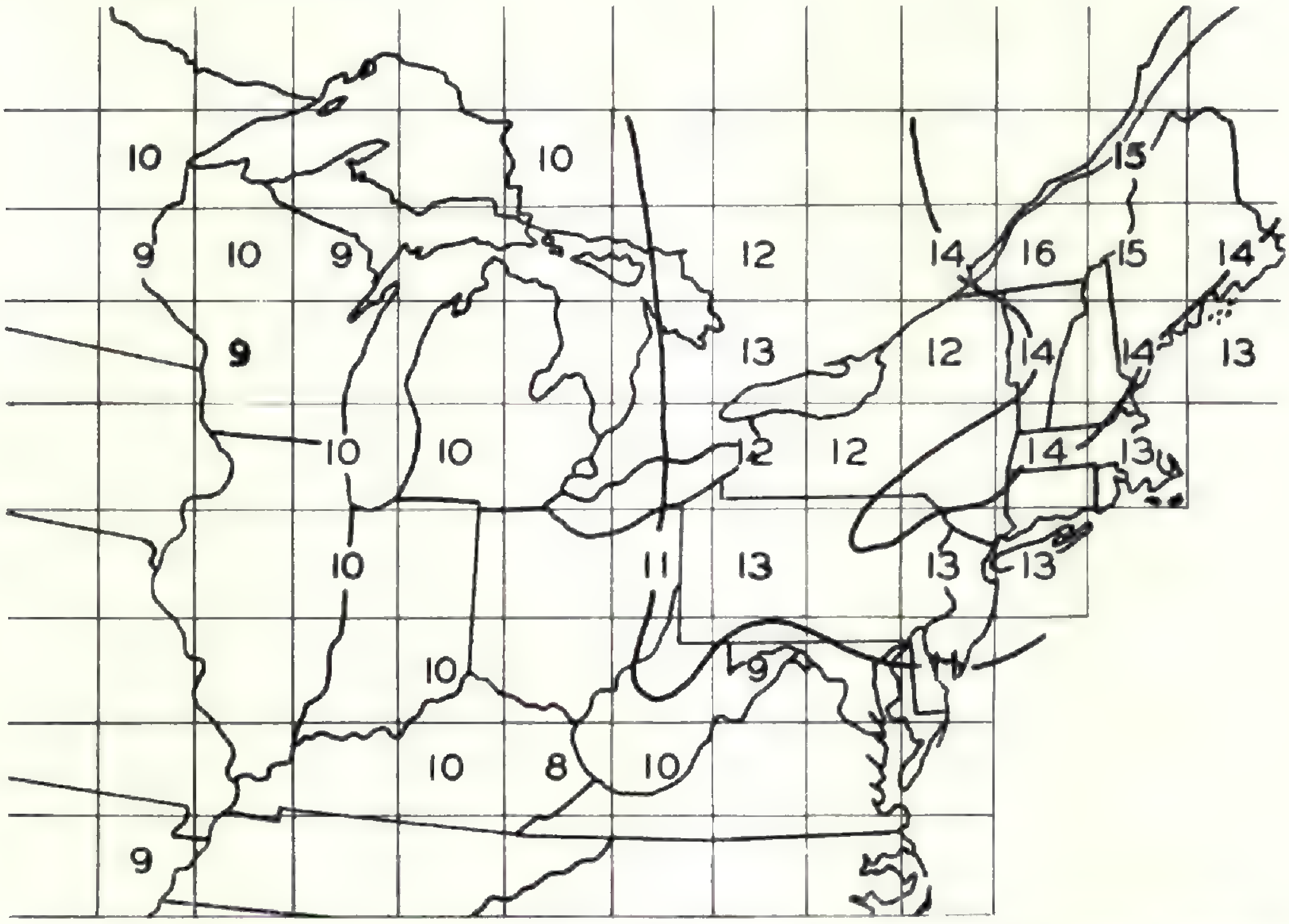
phenes of the values 11 and 14 are drawn to show the gradation of change in this character of crowding.

DISCUSSION

The pattern resulting from the two isophenes, in Map 2, is referred to as a cline. The line with the value 11 may be considered as the eastern boundary of the range of var. *rosea*, and the line with the value 14 as delimiting the western and southern boundary of extreme var. *tomentosa*. The intervening area may be considered as representing the intermediates. It is probable that this cline is the result of hybridization of individuals of the two varieites at the commissure of their ranges. Continuous back-crossing may have been responsible for the broad gradient indicated on the map. This flow of genes from one entity into another has been termed "introgressive hybridization" by

Anderson and Hubricht (1938), and shortened by other writers to "introgression."

Another interpretation of this cline may be that it represents a gradation of this character determined by environmental factors. Ecologists speak of this as an ecocline. According to



Map. 2. Average number of flowers or fruits per centimeter in quadrat samples of *S. tomentosa*. Isophenes represent values of 11 and 14. Base map reproduction by permission of McKnight & McKnight Publishing Company.

this idea, however, it is difficult to account for a concentration of densely-flowered inflorescences only in the northeast instead of also extending into the north and northwest portions of the range where similar environmental conditions occur.

Although data are sparse from the Coastal Plain region, there is some indication that sparsely-flowered individuals predominate. Herbarium specimens collected in southern New Jersey, Delaware, and eastern Maryland are mostly of the inland phase. Fernald also noted this, but considered these plants var. *tomentosa* on the basis of the persisting lanate follicles. It was earlier pointed out that this character is of doubtful importance, therefore it seems more appropriate to consider these plants as var. *rosea*. The southward extent of this plant on the Coastal Plain

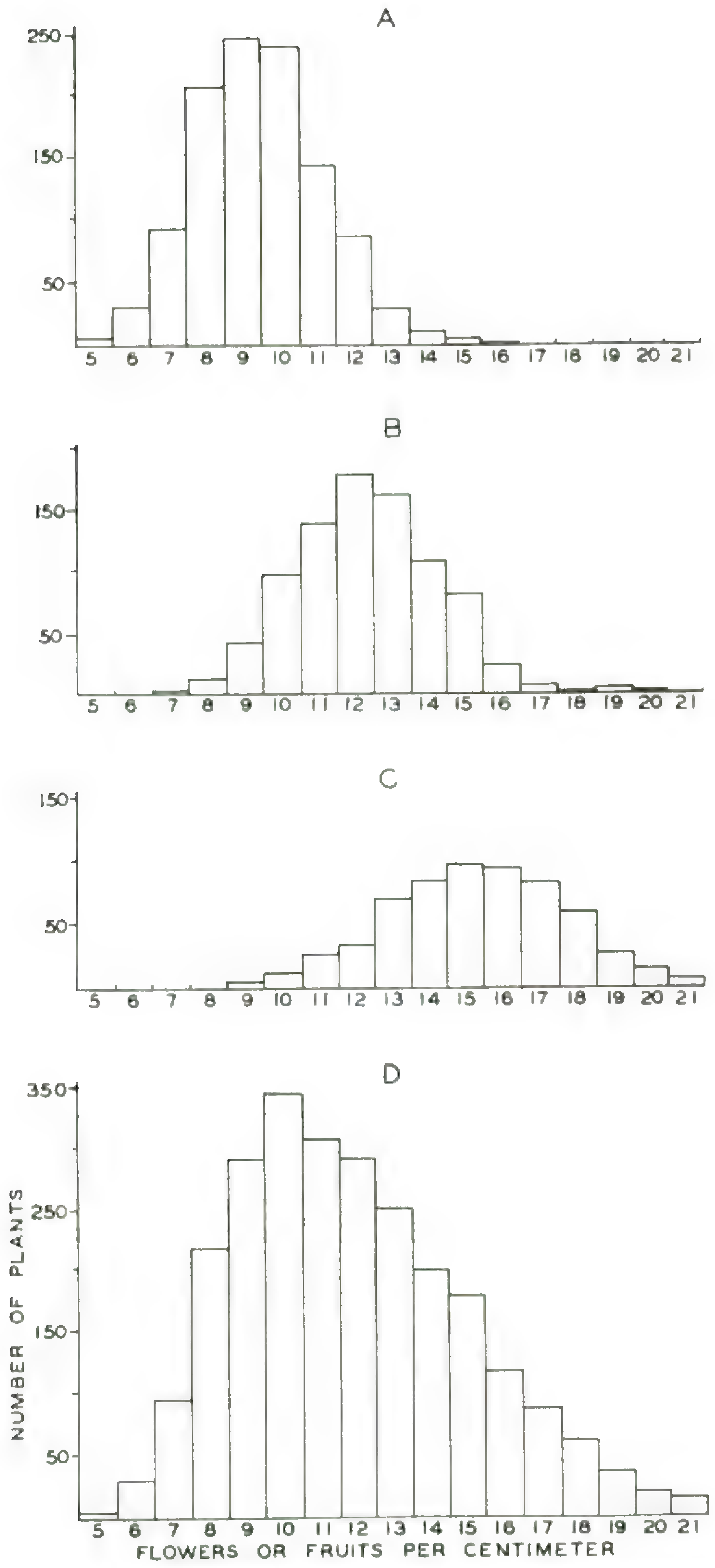


Fig. 1. Frequency distributions of individuals in population samples collected in the (A) west and south, (B) central, and (C) northeast portions of the range of the species (see Map 2). Graph (D) is a composite of (A), (B) and (C).

and the Piedmont Plateau could not be readily determined. The southeastern limit of the species, in Map 1, is based on a single specimen collected from South Carolina.[1]

In both Map 1 and Map 2 the arithmetic means along the New England coast are somewhat lower than in the interior. This suggests that some introgression of the sparsely-flowered variety may have occurred as far north as Maine and Nova Scotia.

The distribution of the individuals of population samples from the geographic area of each variety as well as of the species as a whole is shown in Fig. 1. In neither variety is the range of variation equal to that of the species. The overlapping ranges suggest a close relationship between the varieties. Individuals which may be considered var. *rosea,* in general, have 5 to 16 flowers or fruits per centimeter, while those of var. *tomentosa* generally have 9 to 21 per centimeter. This presents a problem in classifying, from the taxonomist's viewpoint, individuals within the 10 to 15 range. For example, a single specimen taken at random from a colony may have an inflorescence with a count of 10 flowers per centimeter, but the arithmetic mean for the entire colony might be 15. Is there any justification for calling this single plant var. *rosea?* Similarly it is sometimes difficult to classify population samples with intermediate averages. In general, population samples of var. *rosea* average 8 to 11 flowers or fruits per centimeter, and those of var. *tomentosa* average 14 to 17 per centimeter. Those with averages of 12 and 13 must be considered intermediates. In annotating them consideration must be given to their geographic distribution.

Although it is difficult to classify individual plants, and sometimes colonies, nevertheless, the general tendencies in the population samples show definite geographic affinities, and indicate the presence of two varieties. Since it seems necessary that some basis for distinguishing them be made, the following key will perhaps be of value.

a. Inflorescence densely-flowered, the pedicels hardly visible; in a colony the mature flowers or fruits average 12–17 per centimeter on the branches.

[1] Additional information from North Carolina has since been obtained through the courtesy of Dr. William B. Fox. Collections from Chowan, Tyrell, Bertie and Halifax counties average respectively, 9, 10, 9, and 9 flowers or fruits per centimeter.

b. Flowers rose-colored . . . . *Spiraea tomentosa* L. var. *tomentosa*

bb. Flowers white . . . . *S. tomentosa* L. var. *tomentosa* f. *albiflora* Macbr.

aa. Inflorescence less dense than above, the pedicels easily visible; in a colony the mature flowers or fruits average 8–11 per centimeter on the branches . . . . *S. tomentosa* L. var. *rosea* (Raf.) Fern.

Ecology and Distribution

S. tomentosa ranges from Nova Scotia to Minnesota, southward to Georgia and Arkansas. Field observations in the northern portion of this range, from Wisconsin to southwestern Quebec and Pennsylvania, indicate that the species prefers open places on acid soils, especially in pastures, and at the margin of bogs, sloughs and swales. A local study of the plant in the region of Granby, Quebec (Gille, 1949) disclosed similar habitat preferences. Its presence in these habitats implies that it is a successional rather than a climax species.

Although abundant in glaciated territory, the species probably migrated from some regions south of the terminal moraine. The unglaciated Allegheny Plateau, the Ozark Plateau, and the Driftless Area of southwestern Wisconsin and adjacent portions of Illinois, Iowa and Minnesota have been considered by botanists as plant refuges. More recently Wherry (1933) considered the northern portion of the Coastal Plain and the adjacent Piedmont Plateau as another possible refuge. From these areas it is probable that the species migrated in postglacial time.

It is not known whether the two varieties of *S. tomentosa* were distinct prior to migration from these refuges. The proximity of var. *tomentosa* to the two eastern refuges seems to indicate that its route of migration was northward and northeastward from them to its present location. The distribution of var. *rosea* indicates that it may have survived in all of these areas. However, the occurrence of the plant in the Driftless Area is confined chiefly to sandy areas formerly occupied by glacial lakes. This seems to indicate a postglacial migration of the plant into the region. The sparsity of plants in the Ozarkian area may imply either a recent migration into this region or an attenuation due to increasing aridity.

These possibilities of survival and migration may account for the present distribution of the species, but fail to explain the variation in abundance throughout the range. In the northeast the species is common in open pastures. Along the southern and western peripheries of its range it is quite rare. Extensive land utilization in the latter regions may have resulted in the destruction of many habitats. It is also probable that post-glacial climatic changes may have been earlier contributing factors to this reduction in abundance. The one or more xeric periods proposed by Sears (1935) and Transeau (1935) suggest that the plants in these regions may have been reduced to relic status prior to settlement.

Summary

The study of the inflorescence of *Spiraea tomentosa*, in population samples and herbarium specimens, corroborates the presence of two varieties. The more crowded inflorescence is characteristic of var. *tomentosa*, which occurs in the northeastern part of the range of the species. Var. *rosea*, with the less crowded inflorescence, is the common phase in the interior and on the Coastal Plain. Although some individual plants of one region may seem to be characteristic of the other region, colonies within each region are quite distinct.

Acknowledgements

The writer is indebted to Professor Norman C. Fassett for many population samples and for his friendly suggestions and criticisms of this work. A grant from the Wisconsin Alumni Research Foundation supported the writer as a research assistant and enabled him to collect many samples. Other samples were obtained through the kind cooperation of Dr. Wendell H. Camp, Dr. Olga Lakela, Dr. L. K. Henry, Dr. Herbert M. Clarke, Dr. Yves Desmarais, Dr. Forest W. Stearns, Mr. Joseph Barrell, Mr. David F. Grether, Mr. Robert Burton, Mr. Robert H. Brown, Mr. Robert Frey and Mrs. Margaret S. Bergseng. The writer also wishes to express his appreciation to the curators of the following herbaria for the loan of specimens: Gray Herbarium, Missouri Botanical Garden, Philadelphia Academy of Natural Sciences, University of Cincinnati, University of West Virginia and the University of Wisconsin.

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Literature Cited

Anderson, E. 1941. The technique and use of mass collections in plant taxonomy. Ann. Mo. Bot. Gard., **28**: 287–292.

———, and L. Hubricht. 1938. The evidence for introgressive hybridization. Am. Jour. Bot., **25**: 396–402.

Fernald, M. L. 1912. The inland variety of *Spiraea tomentosa*. Rhodora, **10**: 52.

Gille, A. 1949. Le *Spiraea tomentosa* L. dans la region de Granby (comte de Shefford, Quebec, Canada): etude ecologique et phytosociologique. Vegetatio, **2**: 166–196.

Macbride, J. F. 1915. A white-flowered *Spiraea tomentosa*. Rhodora, **17**: 143.

Sears, P. B. 1935. Glacial and postglacial vegetation. Bot. Rev., **1**: 37–51.

Transeau, E. N. 1935. The prairie peninsula. Ecology, **16** (3): 423–437.

Wherry, E. T. 1933. The geographic relation of *Sarracenia purpurea*. Bartonia, **15**: 3–6.

Woodson, R. E. 1947. Some dynamics of leaf variation in *Asclepias tuberosa*. Ann. Mo. Bot. Gard., **34** (4): 353–432.

Frog Spit and Pond Scum[1]—Marine algae are generally known as seaweeds, but there is no comparable term for the freshwater forms which include many microscopic and thread-like plants which become apparent only in great numbers and which, because of their great differences in structure and physiology, are classified in several major divisions. These small forms of life are not only curious and often beautiful, but are of interest and importance because of their place at the base of aquatic food chains and because they sometimes play a detrimental role in potable water reservoirs.

The appearance of Prescott's "Algae of the Western Great Lakes Area" marks an important milestone in Midwestern phycology. Although excluding from the present volume the diatoms and the desmids (a group in which Prescott is an authority), this *magnum opus* is still nearly a thousand pages. It represents a significant achievement of the author and an important addition to the growing list of magnificent books published at cost as a service to science by the Cranbrook Institute of Science. Although limited to aquatic algae (excluding those of the Great Lakes) of Wisconsin and Michigan, and without attention to terrestrial forms, this manual will be widely used in the United States as well as by persons especially interested in phycology throughout the world. There are recent good books in English on the morphology, physiology, and taxonomy of algae, and there is an extensive although widely scattered journal literature, but no book of regional coverage known to the reviewer describes, keys-out, and illustrates, within the limits mentioned above, all of the known algal flora of a region.

The author has worked many years, both in Wisconsin and Michigan, carrying out the survey on which his book is based and accumulating his records of about 1300 species. A very large number of published records for algae have not been accepted by Prescott. Unless substantiated by pre-

[1] *Algae of the Western Great Lakes Area.* By G. W. Prescott. xiii + 946 pp. Aug., 1951. Bull. 31, Cranbrook Institute of Science, Bloomfield Hills, Michigan. $10.50.

served specimens or for other reasons known to be authentically reported, Prescott has preferred, and wisely so, to exclude reported species which have not come within his personal experience and observation. There remains, however, an impressively large number of species which come within his familiar purview.

The algae of the Western Great Lakes area are probably as well known as are those of any region of comparable size in the world. Prescott's useful compendium (together with his many original contributions), and the published books and papers of Gilbert M. Smith, Edgar N. Transeau, L. H. Tiffany, Francis Drouet, Charles M. Palmer, Clarence E. Taft, and many others, provide an extremely comprehensive and useful series of publications for the region, not only for phycologists, but also for hydrobiologists in general.

One of the outstanding features of Prescott's book is the final section which consists of 136 full-page plates, each with numerous line figures. Although considerable page space has been lost, the arrangement of the plate-legend on the lefthand page opposite each plate makes for ready comparison of the species involved. These legends give the Latin name, authority, and magnification of each of the species illustrated. Actual average dimensions of cells, colonies, etc., however, must be sought in the text. The illustrations are well drawn and the cuts are clean and well printed. In most cases related species occur on the same or succeeding plates, but there are some instances in which the illustrations of certain species are far removed from their congenors. To have avoided this would have required a considerable additional expenditure of time for the author and cost for the publisher, as the earlier plates were engraved several years before publication.

Among the distinctive features of Prescott's book is the bibliography which lists alphabetically about 700 authors and twice that many titles. The bibliography is apparently complete as to the literature in which each species and higher category was originally described. Pertinent manuals, floras, and other studies are also included. Publications relating to the region covered by the present manual are indicated by an asterisk. Important works concerning algal morphology, reproduction, and taxonomy are also indicated by a special symbol and referred to at appropriate places in the text. Thus it is possible for a student of the algae to turn easily from the manual to other sources of information to reinforce his knowledge of any group. In cases where there are several papers by the same author, they are listed chronologically in a continuous paragraph. The fact that the years of publication, as well as the special symbols referred to above, are not made to stand out by the use of bold-face type sometimes makes it tedious to find a particular reference, but this is a very minor criticism in the light of the large and useful bibliography which has, the reviewer believes, been carefully prepared by the author who has seen all the cited material and by the editor who has looked after standardization of style.

At the end of the systematic account, which covers about 500 pages, there is an analytical key to genera conveniently set in dichotomous form with consecutive numbering. This is a style that is economical of space and easy to follow. Thereafter is a 14-page glossary of technical and phycological terms and many others useful in the study of algae. Preceding the systematic account there are 13 plates with numerous figures illustrating morphological terms. This is a very useful feature of the book as the illustrations are grouped according to their relationships, rather than alphabetically. Thus there are groups of terms related to plane surfaces, regular solids, irregular

forms, terminal shapes and structures, surface characteristics, branching types, etc. The index contains mostly scientific names and refers to the plates as well as to the text references.

There are two non-taxonomic chapters of general interest. One treats geographical and geological features of algal distribution and the other the ecology of phytoplankton, especially the relations of these free-floating mostly microscopic algae to lake productivity.

To the reviewer, who is not a phycologist, Prescott's new book seems completely competent and reliable, and it will, I am sure, receive the praise of his professional colleagues who are specialists in algae. Foe the ecologist, general biologist, and amateur who is fortunate enough to own a microscope, Prescott's manual will be an important tool and the gateway to many pleasures with these ubiquitous but too little known organisms.—STANLEY A. CAIN, SCHOOL OF NATURAL RESOURCES, UNIVERSITY OF MICHIGAN, ANN ARBOR.

Volume 53, no. 635, including pages 249–272 and plates 1176–1180, was issued 21 November 1951.

ERRATA

Page 20, line 21; for var. *neogaeas* read *neogaea.*

Page 41, line 35; for *on* read *one.*

Page 60, line 26; *for* mentoned *read* mentioned.

Page 73, line 5; for *Malaxia* read *Malaxis.*

Page 85, line 37; for *trifida* read *trifida,* var. *verna.*

Page 88, line 22; for *latifolium* read *hybridum.*

Page 112, line 31; for TENELLUM read TENELLUM.

Page 130, line 21; for CYPTOPTERIS read CYSTOPTERIS.

Page 160, line 6; for *Trigolochin* read *Triglochin.*

Page 187, line 43; *for* Charney *read* Charnay.

Opposite Page 192, legend; for XAMULATA read HAMULATA.

Page 208, line 23; for *includieg* read *including.*

Page 238, line 24; for *foliia* read *foliis.*

Page 247, line 19; for footnote reference see p. 248.

Page 248, line 39; for CORELL read CORRELL.

Page 248, line 42; *for* Scheinfurth *read* Schweinfurth.

Page 252, line 25; *for* vigorus *read* vigorous.

Opposite Page 260, line 18; for *macrophylla* read *macrocarpa.*

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